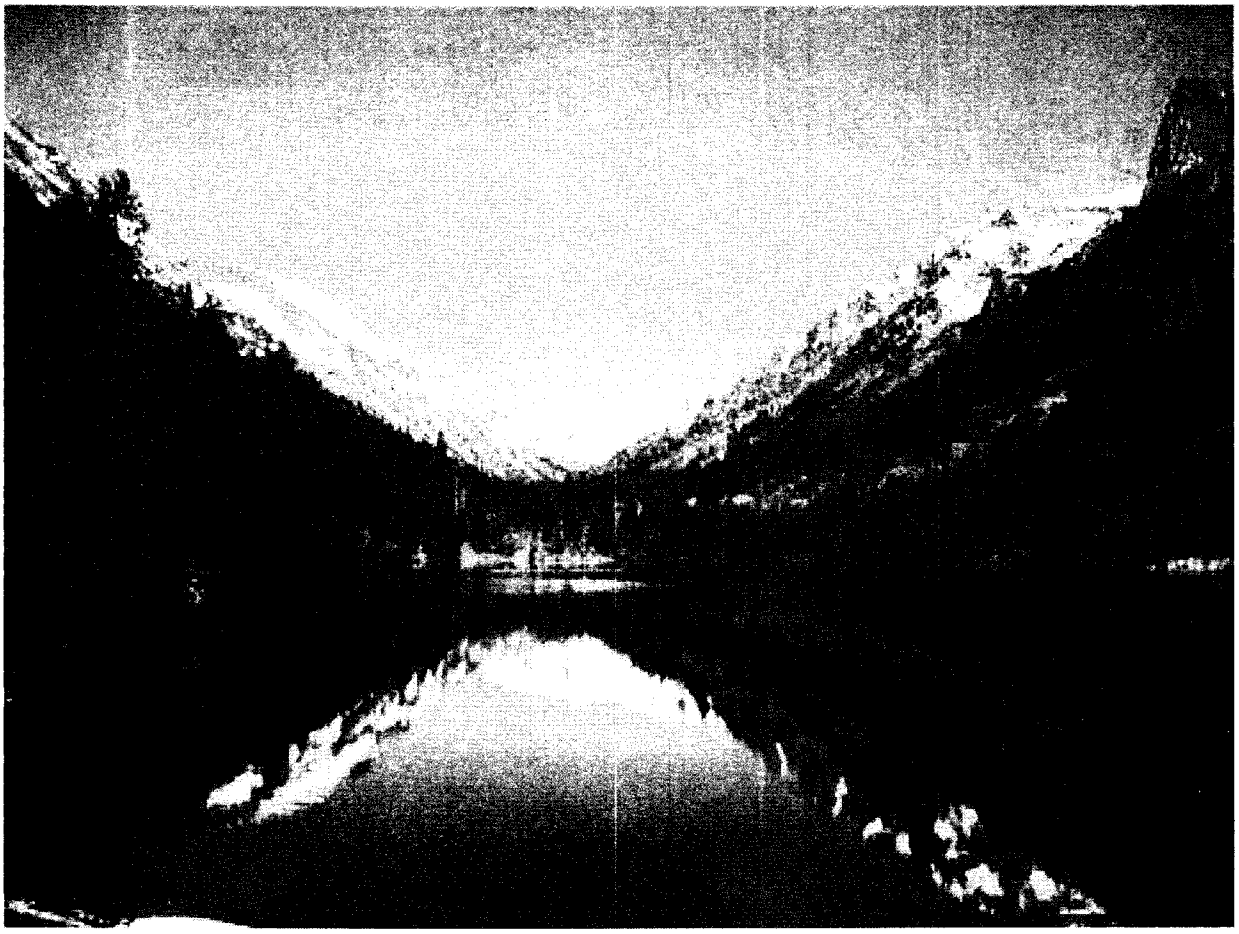
SENATE FINANCE & CLAIMS
Exhibit No. 5
Date 4-7-09
Bill No. HB 8

# Montana Department of Natural Resources and Conservation
# State Water Projects Bureau

## Project Information Report

December 2008



Fred Burr Reservoir

MT DNRC State Water Projects Bureau

The State Water Projects Bureau (SWPB) administers the operation, maintenance, management, and rehabilitation of state-owned dams, canals, and hydropower projects under the purview of the DNRC Water Resources Division.

The following report provides a complete list of the projects, statistical and historical information, and location maps. The SWPB markets water from the state-owned facilities primarily for irrigation and administers approximately 1,965 water-marketing contracts through local water user associations. The water user associations are also primarily responsible for the daily operation and maintenance of the projects. The total combined volume of water marketed by the SWPB per year is 293,609 acre-feet. Revenue from the water purchase contracts, leasing of lands associated with the projects and net revenue from hydropower generation supplement funds for rehabilitation and major maintenance costs. Debt repayment funds are derived from the repayment contracts with water users.

The SWPB ensures that projects are operated and maintained in a safe, efficient manner, are kept to current state dam safety standards, and repayment contracts are properly administered.

For additional information or questions, contact the DNRC State Water Projects Bureau:

State Water Projects Bureau
MT Department of Natural Resource and Conservation
1424 9th Avenue, P.O. Box 201601
Helena, MT 59620-1601
(406) 444-6646
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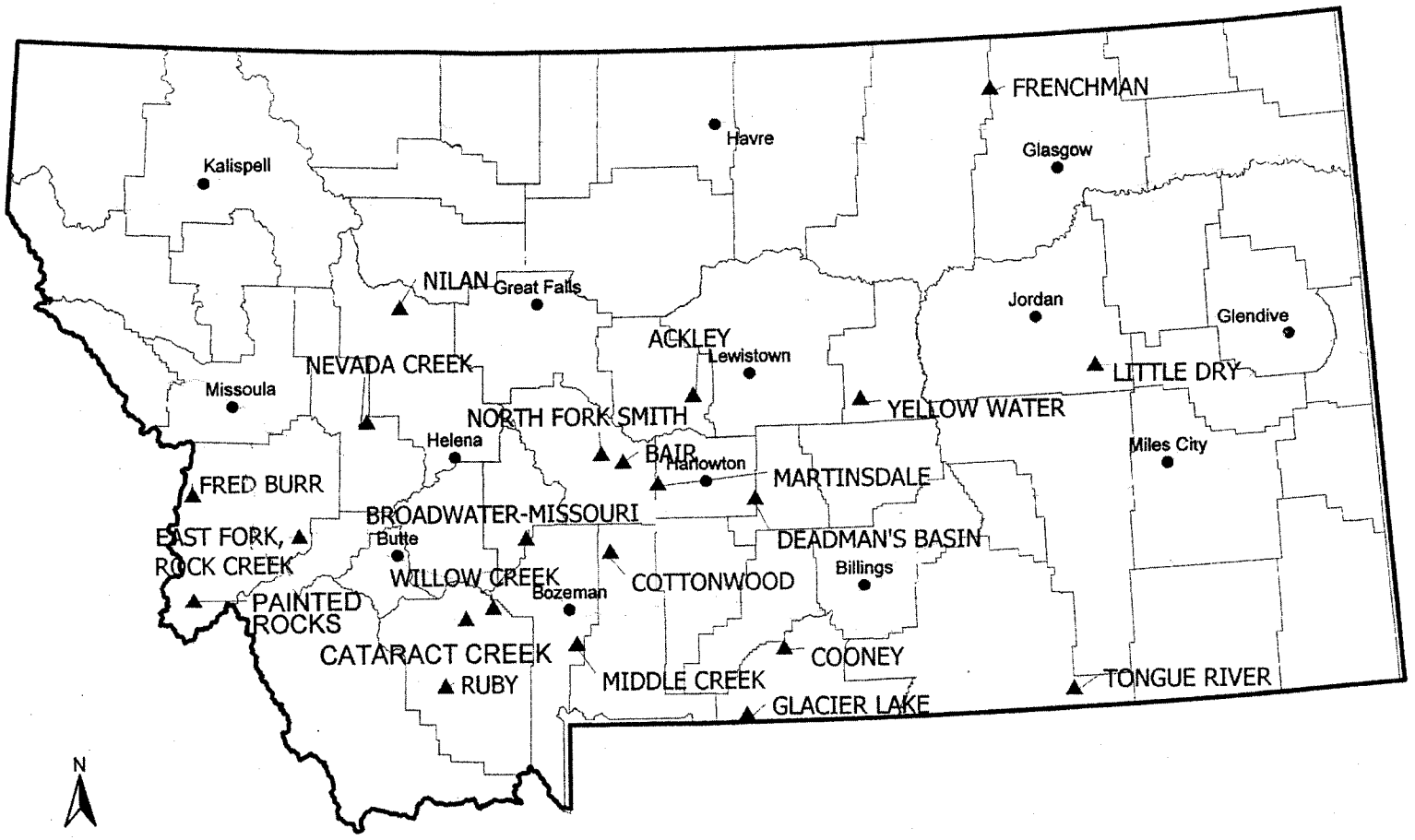
Contents:

# DNRC PROJECTS



**Edited 4/1/2009**

**Future Priorities for Rehabilitation - Estimates of Costs for Water Users and DNRC**

**Current annual inflation rate for heavy civil construction is currently 6% - USBOR data.**

| State Project | Original Construction | County | Full Pool Storage (ac-ft) | Shares Marketed (ac-ft) | Estimated Rehab. Cost - 2008 |
|---|---|---|---|---|---|
| 1. Ruby Dam (spillway, outlet) Feasibility / Alt Study completed. Final Design, Construction Pending Funding. | 1939 | Madison | 37,642 | 38,845 | $13,000,000 |
| 2. Painted Rocks Dam (Gate/Outlet); Feasibility Study Completed. | 1940 | Ravalli | 32,362 | 25,000 | $5,000,000 see note "A" below |
| 3. Willow Creek Dam (spillway). Not scheduled. | 1938 | Madison | 18,000 | 11,900 | $4,000,000 |
| 4. Cataract Creek Dam (spillway, other issues). Feasibility Study in progress - est completion Fall 2009. | 1959 | Madison | 1,478 | 1,395 | $5,000,000 |
| 5. Frenchman Dam (spillway). Feasibility Study est complete April 2009 | 1952 | Phillips | 3,752 | 7,000* | $5,000,000 |
| 6. Ackley Lake Dam (drains, berms and outlet). Rehab completed Winter 2008/2009. Total cost - $1,487,000 | 1938 | Judith Basin | 5,975 | 4,766 | ~~$1,200,000~~ |
| 7. Deadman's Basin Dam (outlet extension, drains). Out for Construction Bids - Spring 2009 - for Fall 2009 Construction | 1941 | Wheatland | 76,900 | 26,842 | $1,100,000 |
| 8. East Fork Rock Cr. Dam (spillway). Not Scheduled | 1938 | Granite | 16,040 | 27,180* | $3,000,000 |
| 9. Cottonwood (aux. Spillway, outlet conduit). Not Scheduled | 1953 | Park | 1,900 | 1,379 | $2,500,000 |
| 10. Fred Burr (outlet lining, spillway). Not Scheduled | 1948 | Ravalli | 525 | 515 | $2,000,000 |
| 11. Glacier Lake (spillway). Not Scheduled | 1937 | Carbon | 4,200 | 21,770** | $2,000,000 |
| 12. Painted Rocks (spillway). Not Scheduled. | 1940 | Ravalli | 32,362 | 25,000*** | $8,000,000 |
| 13. Martinsdale (foundation drain upgrades) Scheduled for Fall 2009, Pending Funding. Additional work/modifications may be required. | 1939 | Wheatland | 23,080 | 21,718**** | $100,000 |

**Table 2 Continued: Future Priorities for Rehabilitation**

| State Project | Completion Date | County | Full Pool Storage (ac-ft) | Shares Marketed (ac-ft) | Est. Rehab. Cost |
|---|---|---|---|---|---|
| 13. Tongue River (aux spillway and outlet). Prototype repairs Fall 2006 completed. Repair performance under evaluation | 1940 | Big Horn | 79,071 | 40,000 | $600,000 |
| 14. Yellow Water (spillway foundation seepage). Not Scheduled. | 1938 | Petroleum | 3,840 | 2,000 | $500,000 |
| **Projected Future Cost - (Present Day Value):** | | | | | **$51,800,000** |

| **Canals** | | | **Capacity** | **Length** | |
|---|---|---|---|---|---|
| 1. East Fork Siphon (replacement). Under Design | 1939 | Granite | 150 cfs | 4,056 feet | $1,600,000 |
| 2. Deadman's Basin Supply Canal (canal lining, drop structures, wasteways, embankments). Ongoing as funding allows. | 1941 | Wheatland | 600 cfs (design) | 11.5 miles | $3,000,000 |
| 3. Nevada Creek Delivery | 1938 | Powell | | | |
| North Canal | | | 49 cfs | 13.4 miles | $600,000 |
| Douglas Canal | | | 50 cfs | 12.6 miles | $500,000 |
| (seepage, erosion, and embankment issues). Not Scheduled | | | | | |

| | |
|---|---|
| **Projected Future Cost - Canals:** | **$5,700,000** |
| **Total - Dams and Canals** | **$57,500,000** |

* Shares marketed (1 share = 1 acre-foot of storage): Frenchman and East Fork show shares marketed greater than full pool.

** Shares marketed for Glacier Lake (Rock Creek Water Users) includes Cooney Reservoir storage.

*** Montana Dept. of Fish, Wildlife and Parks has 15,000 shares at Painted Rocks

**** Shares marketed for Martinsdale (Upper Musselshell) includes Bair Reservoir Storage.

note A - Painted Rocks hydro development would increase projected future cost by est. $12.4 million.

**NOTE: Above list is not all inclusive. Simply reflects the next 15 to 20 years of effort.**

# ACKLEY LAKE DAM

Fact Sheet

## PROJECT DESCRIPTION

- Off-Stream Storage Project located in Judith Basin County
- 5 miles southwest of Hobson
- Owned by DNRC & managed by SWPB
- Operated by the Ackley Lake Water Users Association since 1938
- Popular recreation site. Ackley Lake State Park, managed under lease by the Dept. of Fish, Wildlife and Parks, surrounds the northern half of the reservoir.
- Project consists of:
  - Earthen Embankment Dam, 51 feet high, 3,514 feet long
  - Unregulated, trapezoidal earthen section spillway
  - 4-foot diameter corrugated 8-gage metal pipe outlet conduit
  - 48-inch diameter slide gate valve, manually operated
- Constructed in 1938 by the State Water Conservation Board
- Storage at full pool is 5,975 acre-feet, 260 surface acres
- Off stream of the Judith River. Main watershed intercepted by the supply canal is Antelope Creek, with a drainage area of 2.6 square miles.
- 27 water users have 53 contracts for 4,766 acre/feet of water

## PROJECT DEFICIENCIES

- Excessive uplift pressure may threaten structural integrity.
- Corrugated metal outlet and drain pipes have exceeded design life and need replacement.
- A pool level restriction has been in place due to risk of failure.

## PROPOSED ACTIONS TO ADDRESS DEFICIENCIES

Rehabilitation of the dam will significantly reduce the potential for loss of life and would provide for the continued use of the reservoir for agricultural irrigation, recreation and fisheries. The structure does not meet Montana Dam Safety Act standards. Rehabilitation would bring the structure up to code and extend its useful life for another 50 to 75 years.

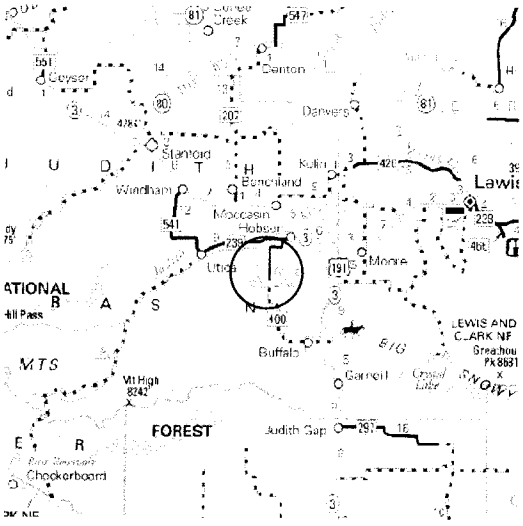
**Rehabilitation Cost: $1,487,257.**

Funding was approved by the 2007 Legislature. Rehabilitation will include the installation of new drains, outlet conduit lining, an earthen berm to reinforce the dam embankment, and a new primary and emergency spillway. Upon completion, the project will meet all current safety standards.

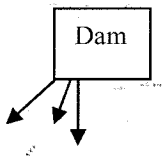
The rehabilitation project is scheduled for completion in the spring of 2009.

## Project Maps and Photographs

Ackley Lake Dam looking east




Area Map



# BAIR DAM

Fact Sheet

## PROJECT DESCRIPTION

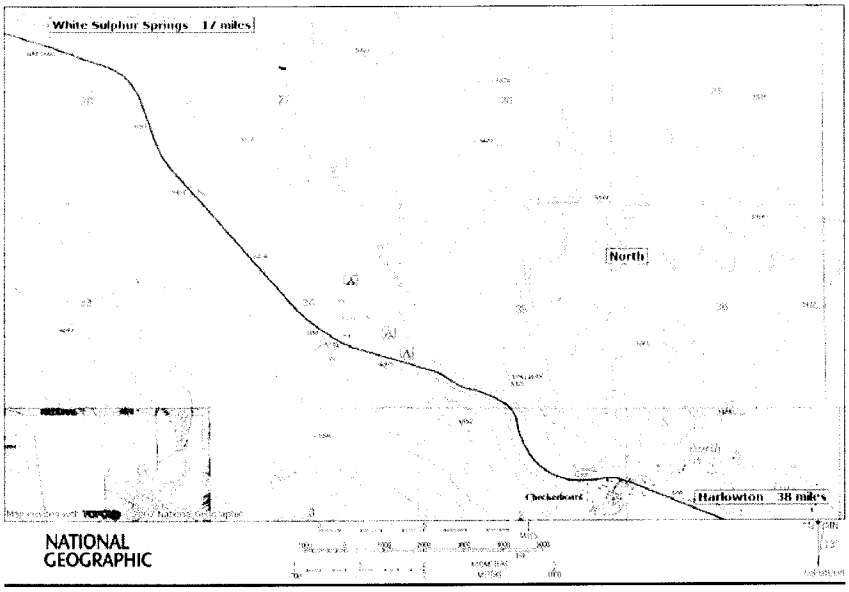
- Located on the North Fork of the Musselshell River in Meagher County
- Approximately ¾ mile upstream of Checkerboard
- Owned by DNRC & managed by SWPB
- Operated by Upper Musselshell WUA since 1940
- Project consists of:
  - Dam, 102' high
  - Concrete chute spillway
  - Gated, reinforced concrete outlet conduit
  - 48-inch butterfly operating gate and 48-inch emergency slide gate with manual operators in a gate house on the dam crest.
- Original construction completed in 1939
- Normal storage at full pool is 7,300 acre-feet
- 11 water users have 21 contracts
  - Project irrigates approximately 4,100 acres with three canals:
    Northfork Diversion Canal (11.7 miles long), Checkerboard Canal (2.9 miles long)
    Two Dot Canal (32.2 miles long)
- The dam is a "high hazard" structure which means that its failure could cause loss of life, 94 people would potentially be impacted
- Checkerboard, numerous houses, roads, bridges, and utilities are located in the flood plain

## REHABILITATION

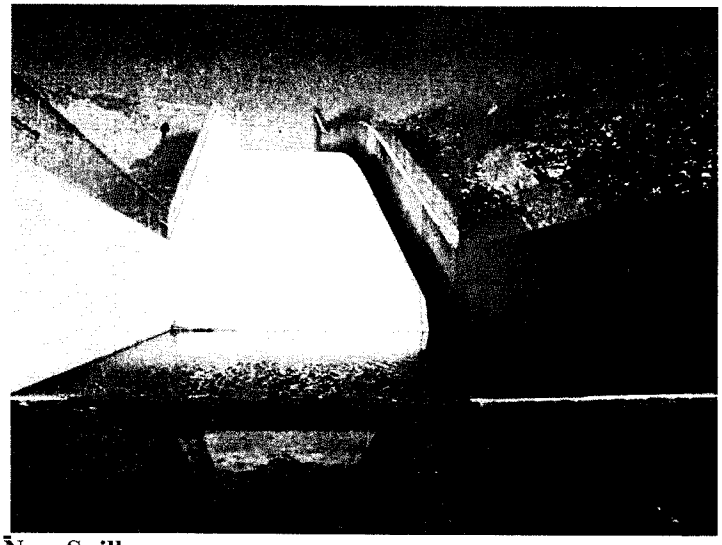
The Bair Dam was rehabilitated in 2003. The dam now meets all current safety standards, with an expected design life of 50 to 75 years. The rehabilitation consisted of the following:

- A new structural concrete spillway was constructed in same location as the old one
- The steep slope above spillway was excavated to gentler slope to alleviate creep and rock fall
- A new concrete conduit outlet structure was installed.
- Add additional toe berm to buttress downstream embankment was constructed.
- New control house, fence, security gates and access road was constructed

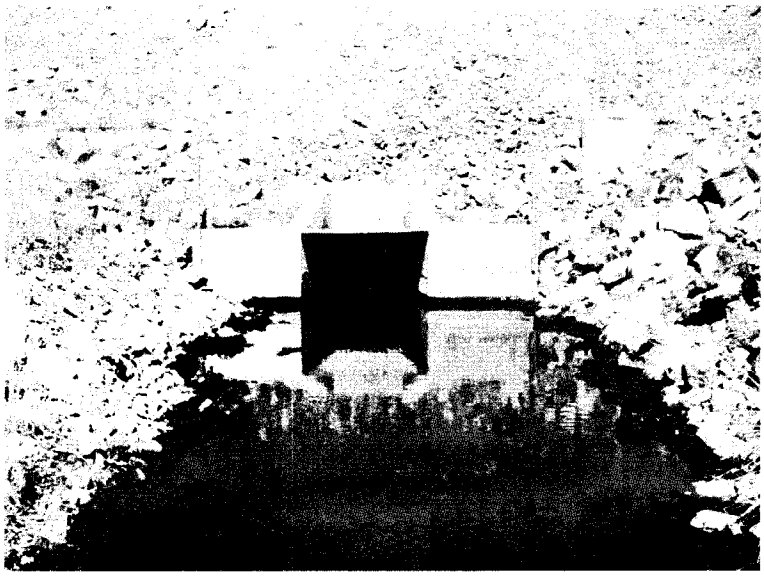
## REHABILITATION COST: $2,738,562



## PROJECT PHOTOGRAPHS



New Spillway



New Outlet Structure

Bair Dam and Reservoir

# CATARACT CREEK DAM

Fact Sheet

## PROJECT DESCRIPTION

- Impoundment on Cataract Creek, from Mason Lake; tributary of N. Willow Cr.
- Located approximately 8 miles southwest of Harrison in Madison Co.
- Owned by DNRC & managed by SWPB
- Operated by Cataract Creek Water Users Association since 1959

- Project consists of:

    - Earthen Embankment Dam, 80 feet high, 775 feet long
    - Controlled, unlined open channel spillway with concrete drop structure
    - 30-inch, horseshoe-shaped 390 foot-long reinforced concrete outlet, with two 30-inch diameter gate valves in series.

- Original construction completed in 1959
- Reservoir stores 1,478 acre-feet at spillway crest
- Provides irrigation water for 16 farms and ranches
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain. The towns of Pony and Harrison are immediately downstream.

## PROJECT DEFICIENCIES

- Existing spillway earthen channel is not capable of safely passing the design flood event.
- Excessive seepage in the right abutment may threaten structural integrity.

## PROPOSED REHABILITATION

A two-phased rehabilitation process is planned. The first phase requires engineering analysis and alternative evaluation to determine the best course of action to address deficiencies. Funding for phase 1 was approved by the 2007 Legislature. The second phase includes the final design and construction.

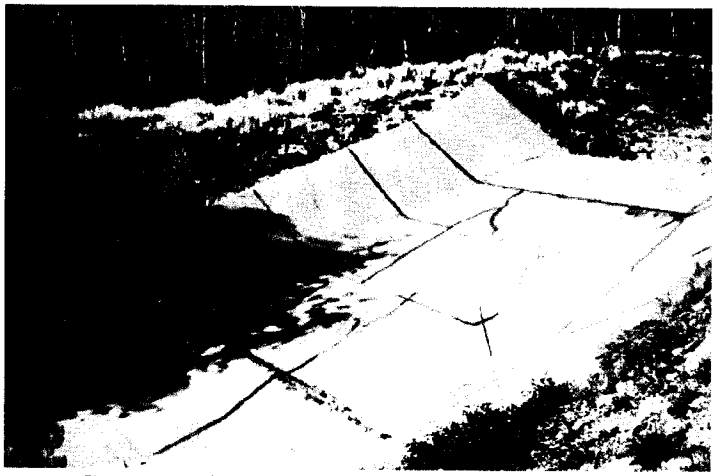
The proposed rehabilitation would include:

- Construction of new spillway and channel that meets current standards.
- Installation of a new seepage collection and drain system.

Estimated Cost $5,000,000

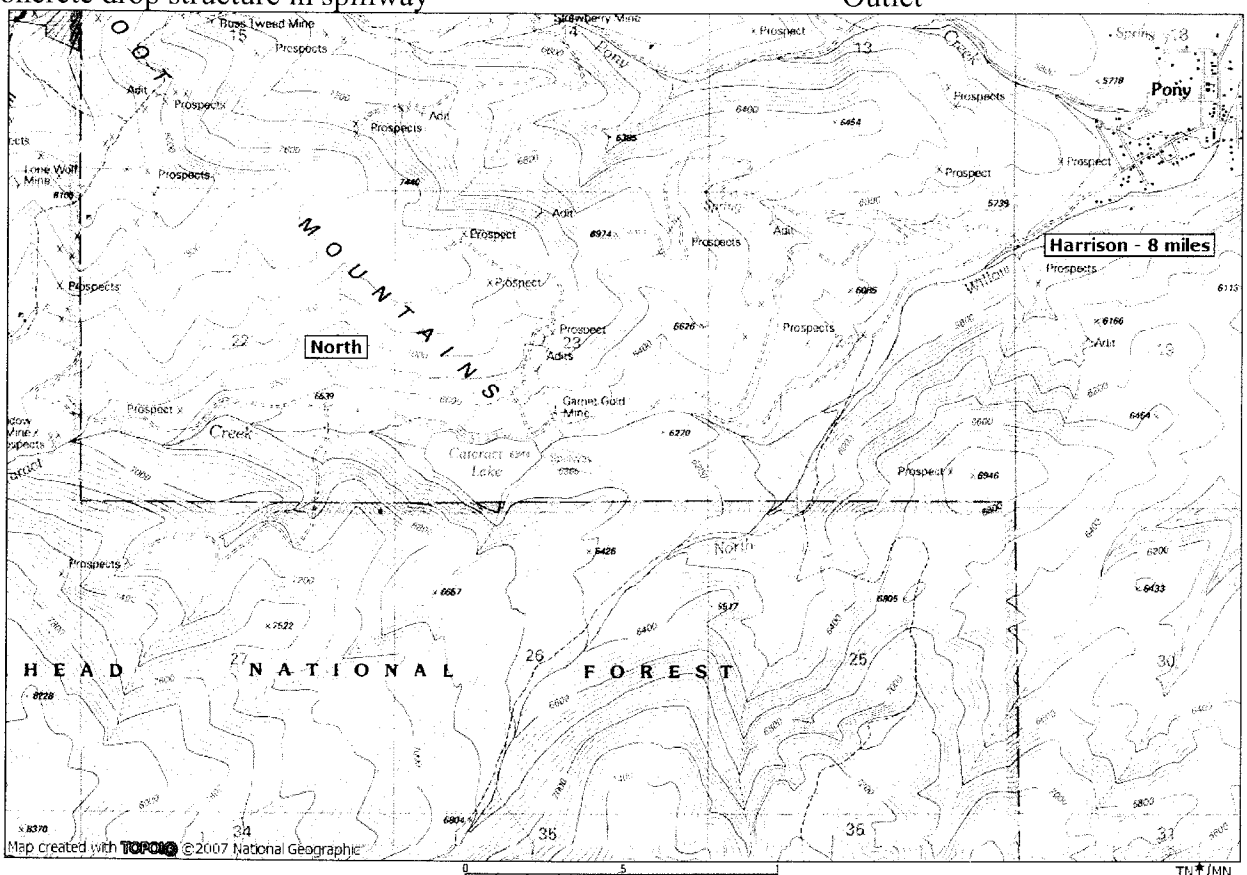
Downstream face of dam

Upstream face



Concrete drop structure in spillway

Outlet



# COONEY DAM

Fact Sheet

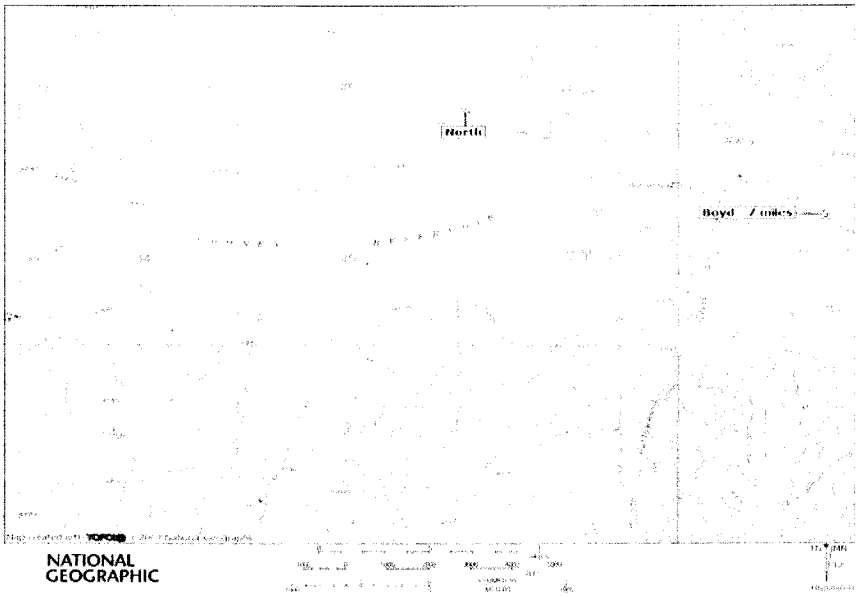
## PROJECT DESCRIPTION

- Impoundment on Red Lodge Creek; also obtains water from Willow Creek and Glacier Lake Reservoir.
- Located approximately 8 miles west of Boyd in Carbon County.
- Owned by DNRC & managed by SWPB
- Operated by the Rock Creek Water Users Association since 1937
- Project consists of:
  - Earthfill Dam, 102 feet high, 2,369 feet long
  - Controlled, ogee crest principle spillway with concrete drop structure in left abutment; fuse plug emergency spillway.
  - 6-foot horseshoe-shaped 630 foot-long concrete outlet, with two 60-inch diameter gate valves (butterfly operating gate and emergency slide gate), in series.
- Original construction completed in 1937
- Stores 28,230 acre-feet at guard dike crest; surface area at normal full pool – 1,078 acres
- Provides irrigation water on approximately 20,000 acres; popular recreation site, with Cooney State Park, managed under lease by the MT Dept. of Fish, Wildlife and Parks, encompassing the north, east and south shore of the reservoir.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain. The towns of Boyd and Joliet are immediately downstream.

## PROJECT DEFICIENCIES AND REHABILITATION

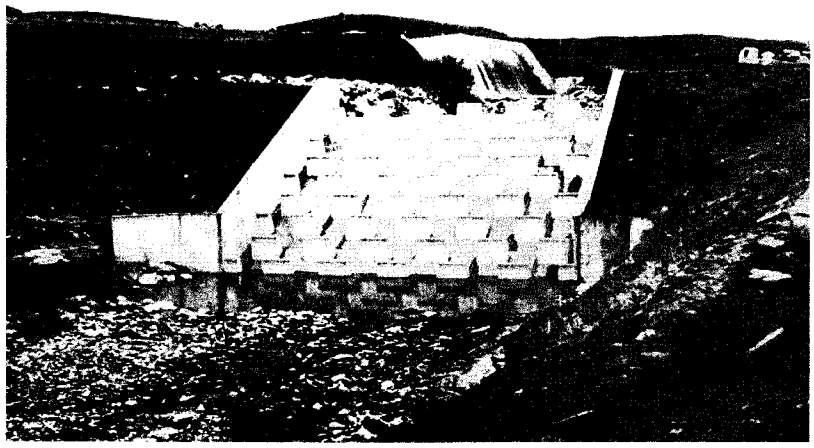
In 1982 the dam was raised 5-feet and rehabilitated. The dam, spillways and outlet works are in good condition and meet or exceed existing dam safety standards. The rehabilitation included:

- Raising the dam embankment 5-feet.
- Replacing the principle spillway
- Adding a guard dike in the spillway approach channel
- Adding a fuse plug emergency spillway
- Replacing the wooden bridge over the principle spillway with a concrete bridge
- Installing additional drains
- rehabilitation cost (1982): $1,288,065

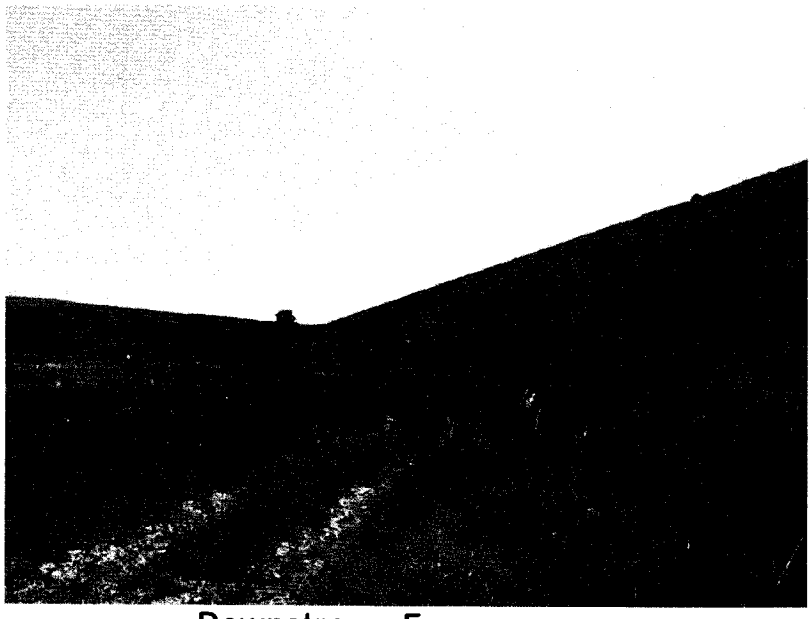


## PROJECT PHOTOGRAPHS

Upstream Face



Spillway



Downstream Face

# COTTONWOOD DAM

Fact Sheet

## PROJECT DESCRIPTION

- Impounds Cottonwood Creek in Park County.
- Located approximately 5 miles north of Wilsall.
- Owned by DNRC & managed by SWPB.
- Operated by the Shields Canal Company since 1953.

- Project consists of:

    - Earthen Embankment Dam, 39 feet high, 610 feet long.
    - Earthfill Dike, 8 feet high, 825 feet long.
    - Uncontrolled guard dike spillway with ogee crested chute and baffle blocks.
    - 36-inch, 197 foot-long corrugated steel pipe outlet with 36-inch vertical slide gate in a rectangular wet tower with controls at the dam crest.

- Original construction completed in 1953.
- Reservoir capacity is 1,905 acre-feet at spillway crest, covering 235 surface acres.
- 1379 acre-feet is under contract with the Shields Canal Company.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Numerous farms and ranches, roads, bridges, and utilities are located in the flood plain.

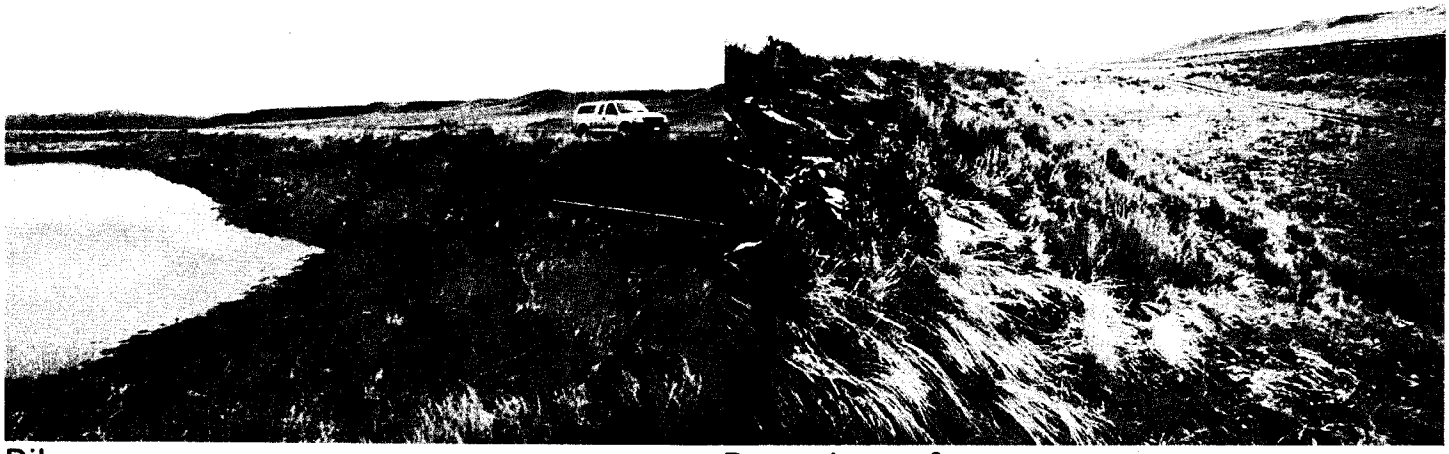
## PROJECT DEFICIENCIES

- Existing drains and outlet conduit are deteriorating and at the end of design life.
- Spillway is undersized and does not meet current safety standards.

## PROPOSED REHABILITATION

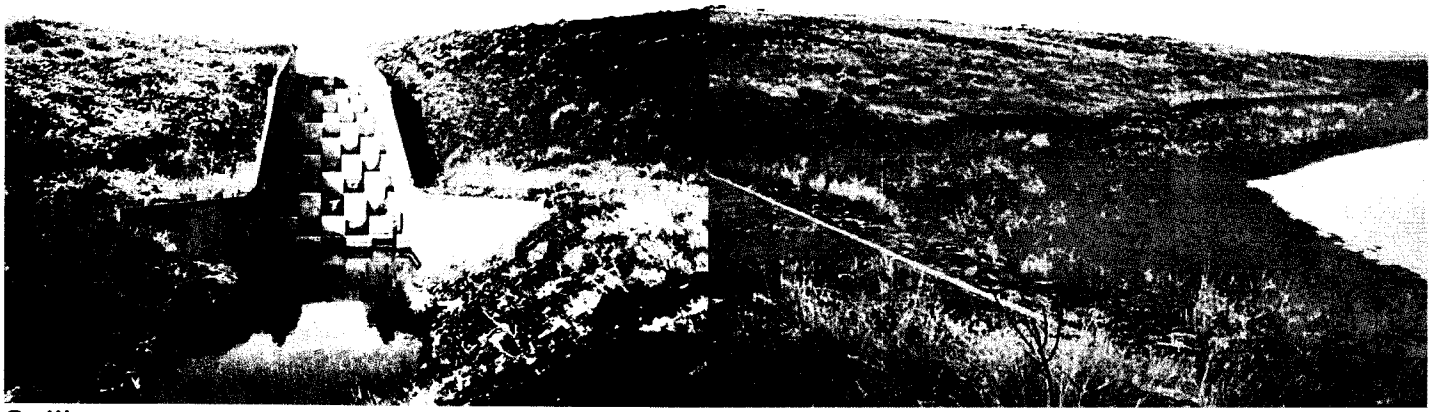
- Replace the spillway or increase freeboard to meet current spillway standards.
- Construct an auxiliary spillway
- Replacing the outlet conduit with a new structure.
- Install new drains for seepage control.

Estimated cost: $1,000,000 for outlet
$1,500,000 for spillway



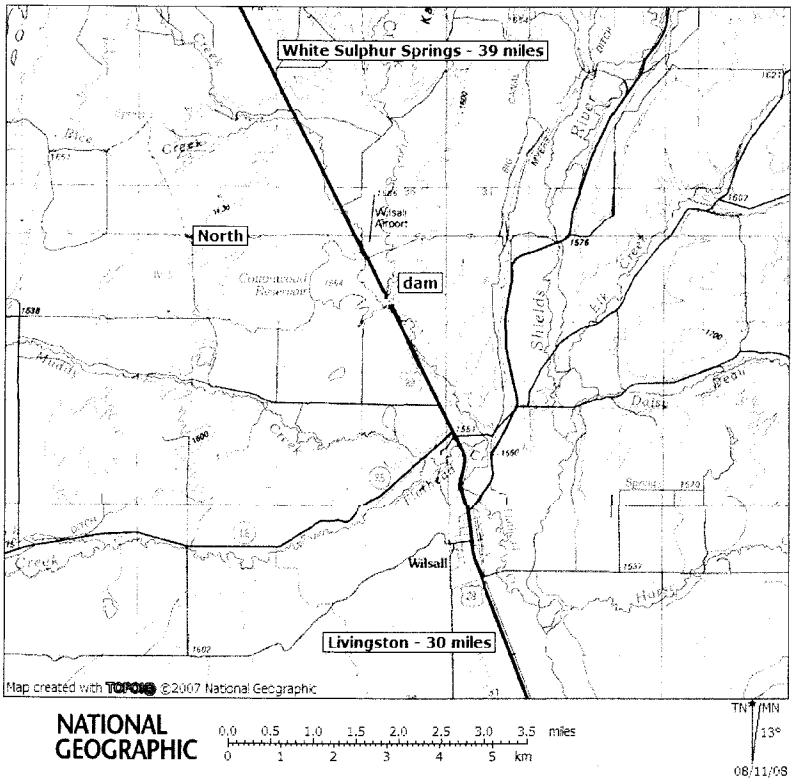
Dike

Downstream face



Spillway

Upstream face



# DEADMAN'S BASIN DAM

## Fact Sheet

## PROJECT DESCRIPTION

- Off-stream reservoir with supply canal from the Musselshell River.
- Located approximately 10 miles east of Harlowton in Wheatland Co.
- Owned by DNRC & managed by SWPB
- Operated by Deadman's Basin Water Users Association since 1959

- Project consists of:
    - Earthen Embankment Dam, 80 feet high, 775 feet long and Earthen Embankment Dike, 18-feet high and 2,950 feet long.
    - Horseshoe-shaped 300 foot-long reinforced concrete outlet tunnel, with two 60x60-inch cast iron slide gates with vertical access tower.
    - 11.5 mile supply canal (600 cfs), two delivery canals (total 12.5 miles)

- Original construction completed in 1941. The dam was raised 10 feet in 1958.
- Reservoir stores 76,900 acre-feet at normal full pool, covering 2,120 surface acres.
- Provides irrigation water for 16 farms and ranches.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain.
- Melstone, Ryegate, and Roundup are dependent on the water from the reservoir for their municipal water systems.
- 490 families, including ranchers, farmers, and residents of small towns, directly depend on receiving their contracted water shares from the Deadman's Basin Water Project.

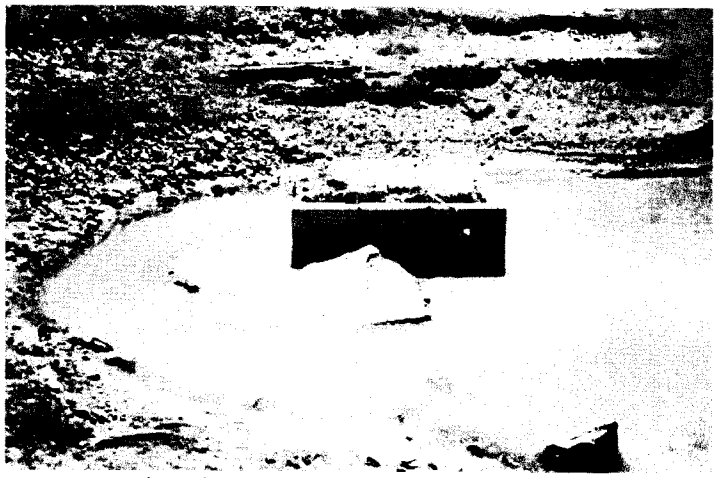
## PROJECT DEFICIENCIES

- Excessive seepage and uplift pressures requires the installation of a drain system and toe berm.
- Requires extension of outlet structure to accommodate toe berm.

## PROPOSED REHABILITATION

- Remove the old outlet structure, extend the conduit, and install a drainage system along side the new conduit extension
- Build a new energy dissipating outlet
- Construct a 15 foot high toe berm with a filter blanket drain

**Estimated Project Cost:** $1,077,852

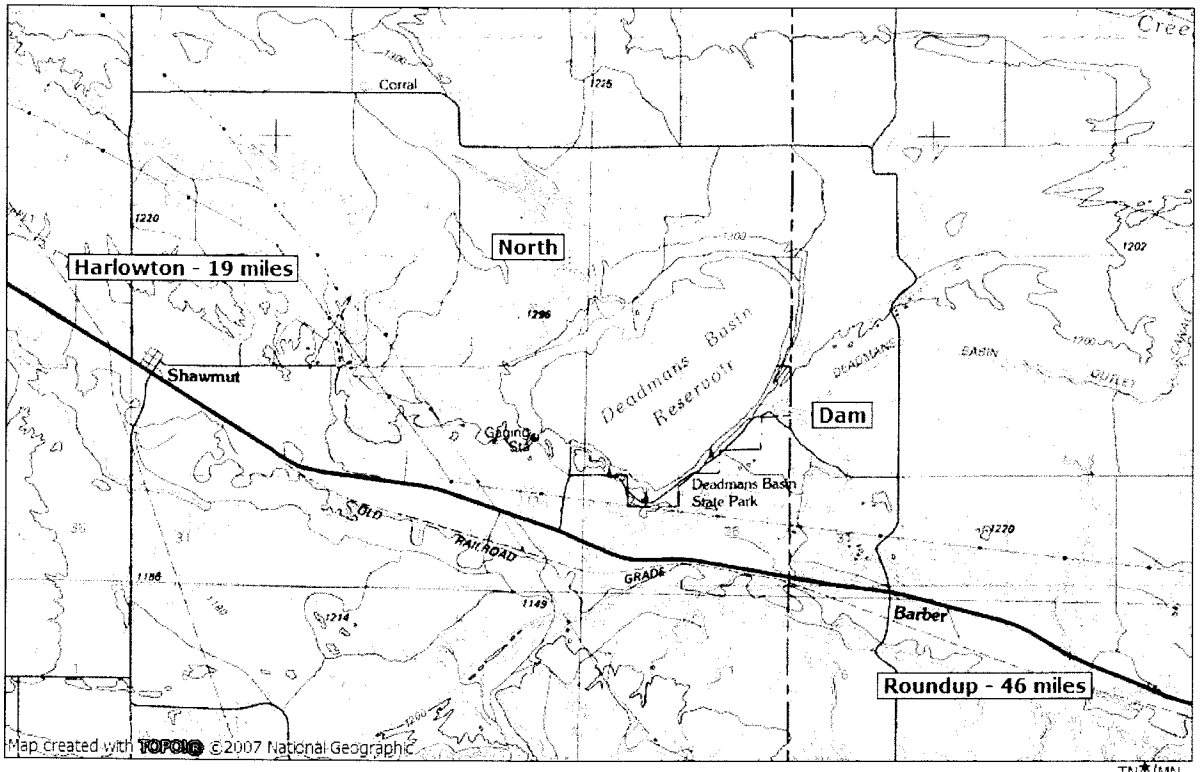


Inlet plugged with sediments

Inlet and upstream face


Low Level Outlet

Low Level Outlet Seepage



# EAST FORK OF ROCK CREEK DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on the East Fork of Rock Creek 15 miles south of Phillipsburg on the Beaverhead-Deerlodge National Forest in Granite Co.
- Owned by DNRC & managed by SWPB under a U.S. Forest Service Special Use Permit.
- Operated by Flint Creek Water Users Association since 1938

- Project consists of:

    - Earthen Embankment Dam, 88 feet high, 1083 feet long.
    - Concrete lined chute spillway with flip bucket energy dissipater
    - 54-inch horseshoe-shaped 472 foot-long reinforced concrete outlet tunnel, with one 54-inch diameter emergency slide gate and one 54-inch butterfly operating gate
    - The gate valves are operated from a 7-foot diameter tower on the dam crest.

- Original construction completed in 1936
- Reservoir stores 16,040 acre-feet at normal full pool covering 390 acres
- Provides irrigation water for 53 farms and ranches
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain.

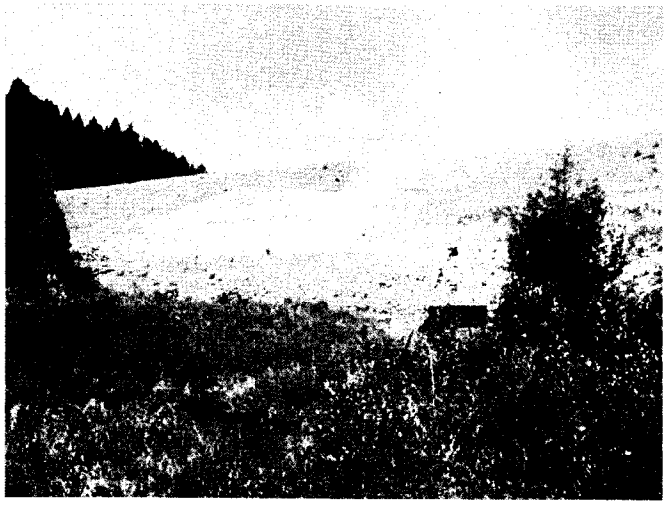
## PROJECT DEFICIENCIES

- The spillway is in poor condition and does not meet current safety standards. Replacement is needed due to concrete deterioration from age and insufficient spillway capacity.
- Excessive seepage may require the installation of additional drains or relief wells.

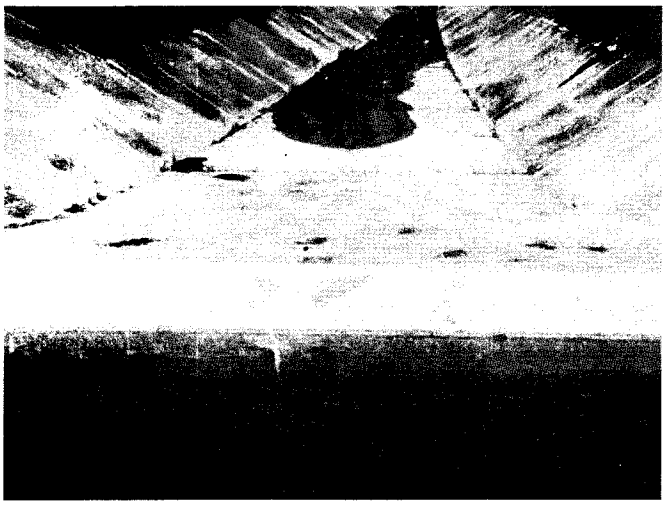
## PROPOSED REHABILITATION

- Construct a new spillway that meets or exceeds current safety standards.
- Investigate the need for additional seepage collection and drains. Install additional drains and seepage collection if needed.

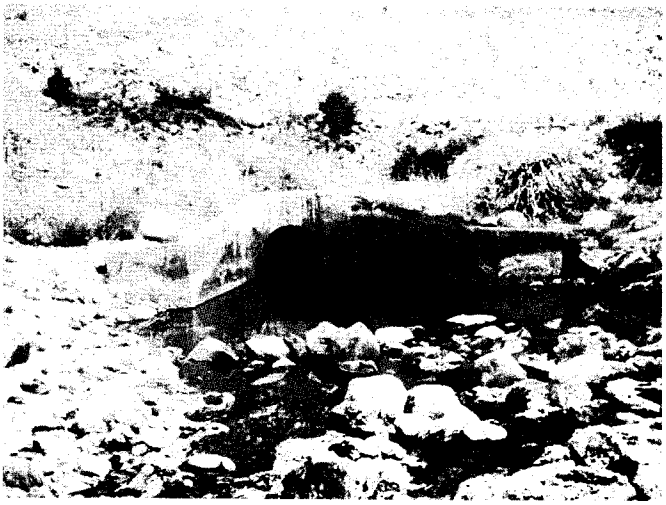
**Estimated Project Cost:** Could exceed $3,000,000



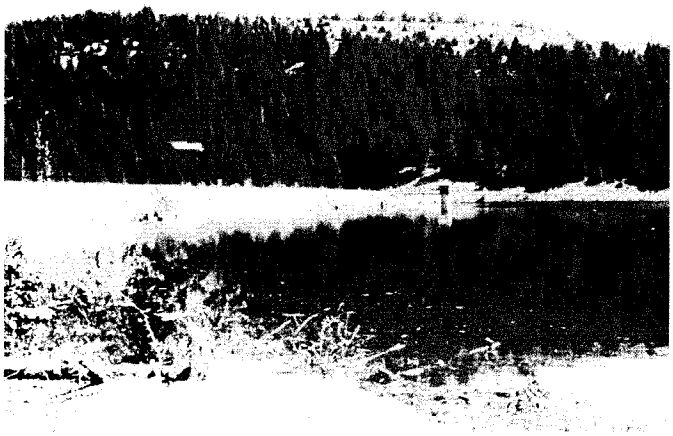
Downstream face



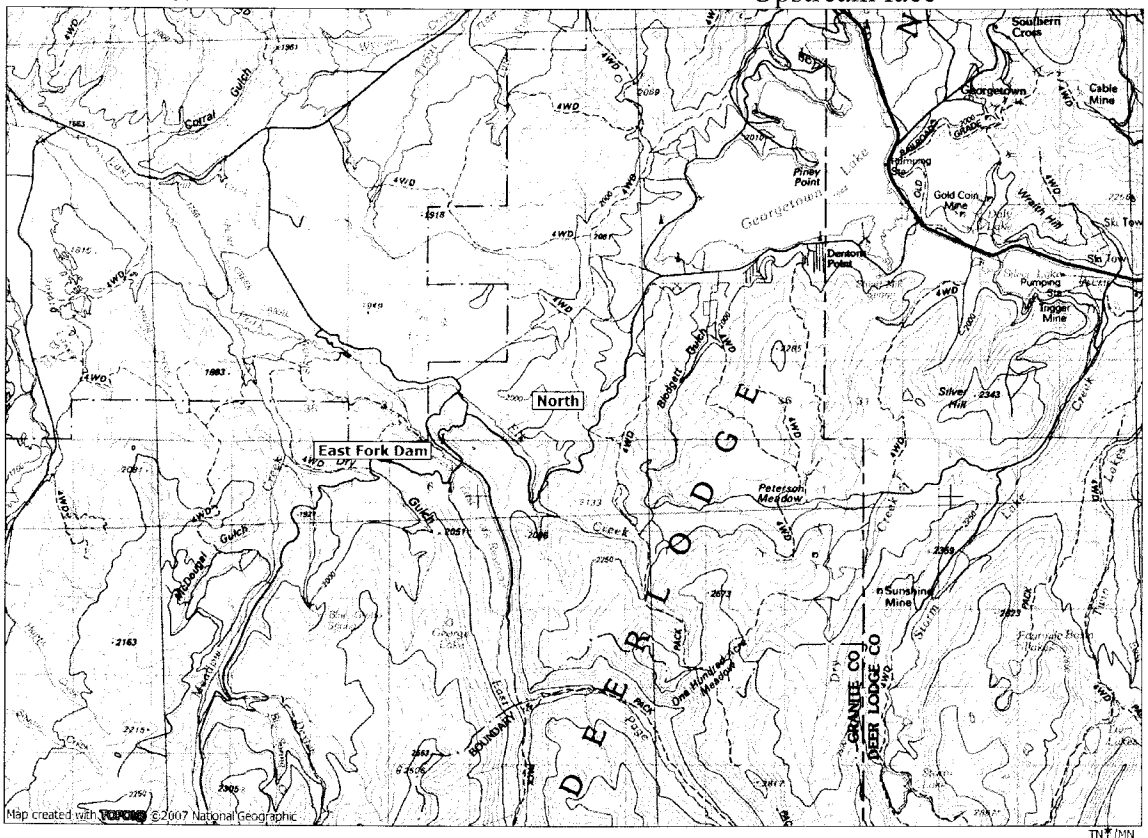
Spillway



Outlet



Upstream face



# FRED BURR DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on public land in the Bitterroot National Forest in Ravalli County, 9 miles southwest of Victor. Impounds the headwaters of Fred Burr Creek.
- Owned by DNRC & managed by SWPB under a U.S. Forest Service Special Use Permit.
- Operated by Fred Burr Water Users Association since 1948
- Project consists of:
  - Rolled earthfill embankment dam, 50 feet high, 325 feet long.
  - 20-foot wide, 120 foot-long, concrete lined rectangular chute spillway with 4.3 foot-high radial gate.
  - Four-foot diameter reinforced concrete conduit, single cell wet tower with control mechanism at the top of the tower on the dam crest.
  - Manually operated 48-inch diameter slide gate.
- Original construction completed in 1948 (dam was breeched during a high runoff episode in the spring of 1948; the dam was reconstructed in 1949).
- Reservoir stores 525 acre-feet at normal full pool and covers 28 surface acres.

## PROJECT DEFICIENCIES

- The spillway is nearing the end of its design life and will require future replacement. Replacement is needed due to concrete deterioration from age.
- Current safety standards may require a substantial increase in spillway capacity.
- The concrete outlet is deteriorating and needs repair. Lining or replacing the outlet are anticipated to be the primary options to correct the deficiencies.

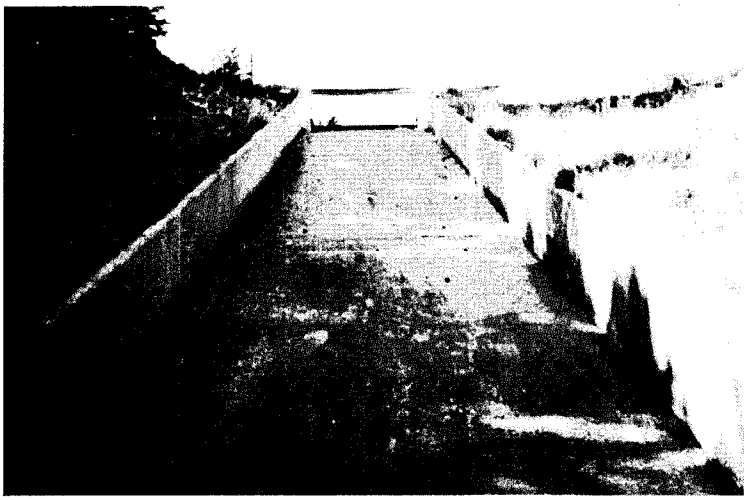
## PROPOSED REHABILITATION

- Construct a new spillway that meets or exceeds current safety standards.
- Line the existing outlet or replace with a new structure.

**Estimated Project Cost**: Could exceed $2,000,000

Fred Burr Reservoir looking west

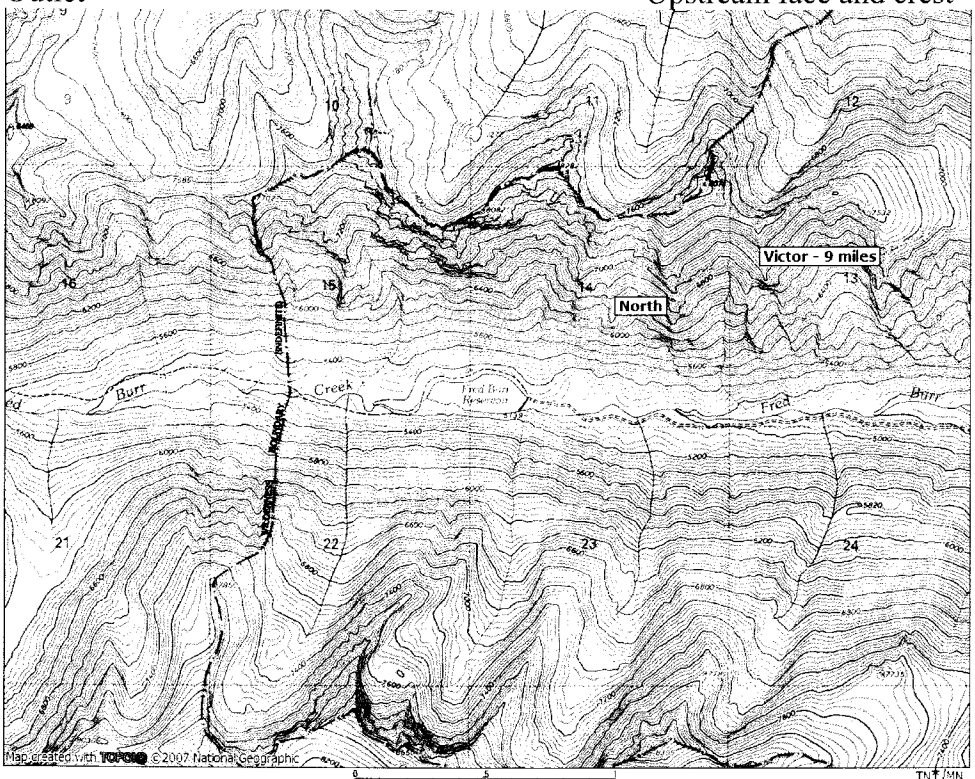
Downstream face



Spillway

Outlet

Upstream face and crest



# FRENCHMAN DAM

Fact Sheet

## PROJECT DESCRIPTION

- Impounds Frenchman Creek in Phillips County.
- Located approximately 20 miles north of Saco.
- Owned by DNRC & managed by SWPB.
- Operated by Frenchman Water Users Association since 1952.

- Project consists of:

    - Earthen Embankment Dam, 44 feet high, 2,100 feet long.
    - Reinforced concrete spillway, 119 feet-wide, with uncontrolled ogee crest.
    - 60-inch, 230 foot-long reinforced concrete outlet with 2, 60-inch slide gates (one emergency and one operating).

- Original construction completed in 1951; the dam failed during a flood in 1952 and was subsequently rebuilt.
- Reservoir storage design capacity was 7010 acre-feet at spillway crest (see deficiencies), covering an estimated 800 to 1,000 surface acres .
- 19 water users, irrigates approximately 7000 acres.

## PROJECT DEFICIENCIES

- Voids underneath the spillway and offset joints indicate progressive deterioration.
- Sedimentation has greatly diminished the storage capacity by about 50% (based on aerial photography the existing capacity is estimated at 3752 acre-feet).

## PROPOSED REHABILITATION

A feasibility study was funded by the 2007 Legislature to determine the best alternatives for rehabilitation. The rehabilitation would include the following:

- Replace the spillway with a new structure.
- Restore lost storage capacity.

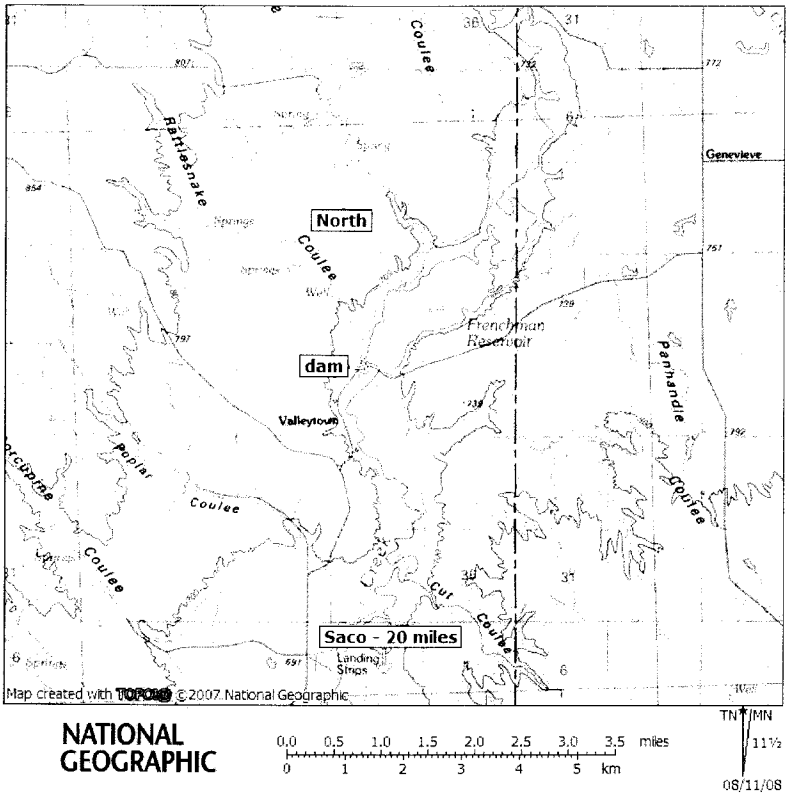
Estimated cost: $5,000,000

Downstream face

Outlet

Spillway and county road bridge

Upstream face



# GLACIER LAKE DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on Rock Creek 35 miles southwest of Red Lodge on the Custer National Forest in Carbon County. Constructed by the State Water Conservation Board in 1937.
- Owned by DNRC & managed by SWPB under a U.S. Forest Service Special Use Permit.
- Operated by Rock Creek Water Users Association since 1937
- The natural storage of Glacier Lake was increased with the construction of two dams;
- Normal full-pool storage is 4,200 acre-feet with a surface area of 151 acres.
- Project consists of:
  - Two rockfill dams with concrete upstream face,

| North Dam | South Dam |
|---|---|
| 57 feet high | 20 feet high |
| 230 feet long. | 253 feet long |

  - Uncontrolled rock channel spillway discharging over a low concrete weir.
  - Low level outlet is a blasted rock tunnel beneath the North Dam, approximately 6.5 feet high by 5.5 feet wide.
  - The outlet is controlled by one 48-inch by 48-inch rectangular slide gate.
  - The operating controls are in a wooden gatehouse, located on the on the North Dam crest.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain.

## PROJECT DEFICIENCIES

- The spillway does not meet current safety standards.

## PROPOSED REHABILITATION

- Construct a new spillway that meets or exceeds current safety standards.

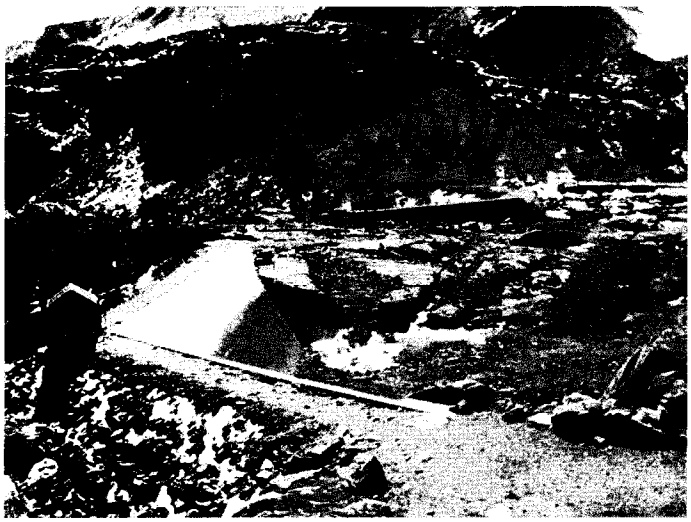
**Estimated Project Cost:** Could exceed $2,000,000

Glacier Lake

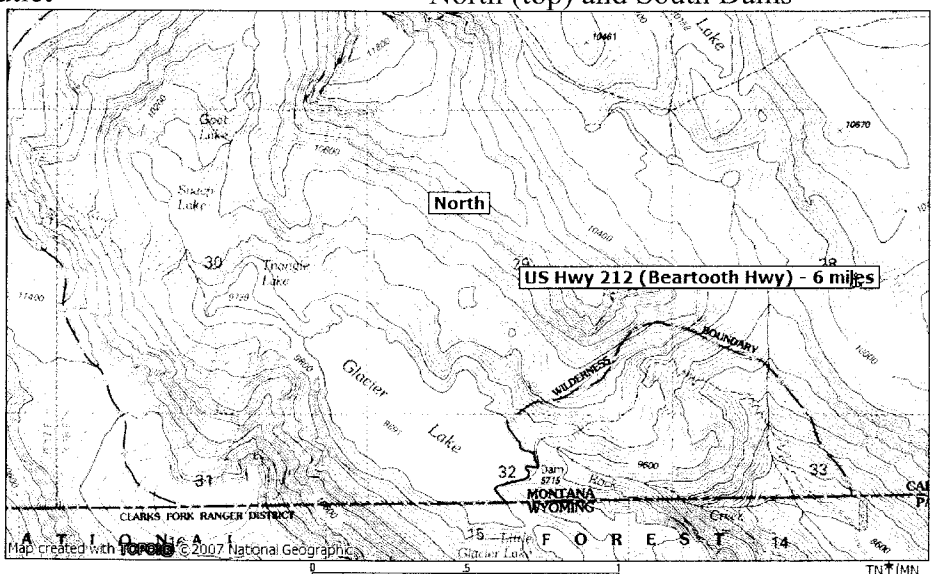
Upstream face

Spillway

Outlet



North (top) and South Dams



# MARTINSDALE DAM

Fact Sheet

## PROJECT DESCRIPTION

- Off stream storage project, in Wheatland and Meagher Counties
- 2.5 miles southeast of Martinsdale
- Owned by DNRC & managed by SWPB
- Operated by Upper Musselshell Water Users Association since 1939
- Project consists of two, Zoned Earthfill Dams:

| North Dam | East Dam |
|---|---|
| 91 feet high | 49 feet high |
| 1,000 feet long | 1,550 feet long |
| Gated, reinforced concrete 60" outlet conduit, 120 feet-long, 54-inch emergency slide gate and 54-inch operating butterfly valve with controls at the top of the tower. | Concrete chute spillway<br>Earth-rock lined emergency spillway |

- Constructed in 1939
- Storage at full pool is 23,348 acre-feet covering 985 surface acres.
- 86 water users have 101 contracts for 21,718 acre/feet of water
- The delivery of irrigation water is vitally important to the water user farm/ranch operations.
- Popular recreation site, primarily for fishing. A DFWP Fishing Access Site is located on the reservoir's north shore.

## PROJECT DEFICIENCIES

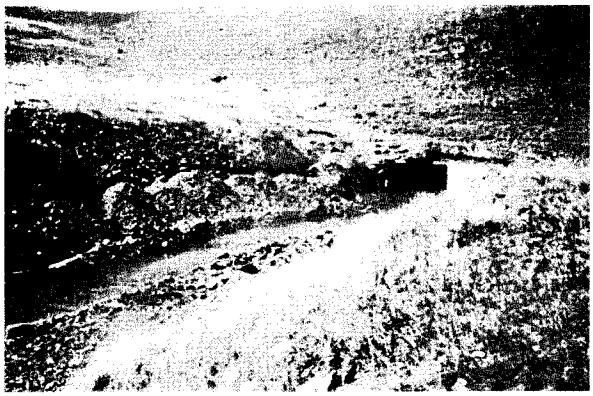
- Large amounts of seepage occurs in the north dam. Grouting for seepage control had limited success. Additional drains were installed in 1985 to collect seepage and improve embankment stability. The configuration of the existing drains makes it unsafe and difficult to monitor flows. In addition, sedimentation is occurring in the toe drain and cannot be accurately measured. Excessive seepage and sedimentation may indicate a potential problem within the dam, but this cannot be determined with the existing drain configuration. In order to improve seepage collection and make accurate measurements of flows and sedimentation, modification of the drains is necessary.

## PROPOSED ACTIONS TO ADDRESS DEFICIENCIES

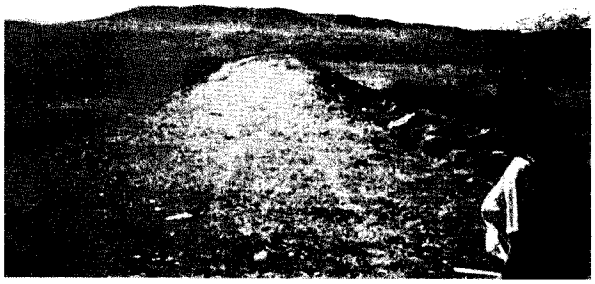
Modification of the drain system to allow accurate and safe measurements of flows and sedimentation, including the following:

- Add manholes to the toe drain system for flow measurements and trapping sediment.
- Redirect the outfall of the right abutment horizontal drain system further downstream to allow for safe and accurate flow measurements.
- Install a right groin drainage system to address the remaining seepage.
- Install automated instrumentation to allow for continual monitoring. The improved monitoring capabilities are required for compliance with the current operating permit.
- The Department is requesting a $100,000 Renewable Resource Grant from the 2009 Legislature for partial project payment. The DNRC will pay for remaining cost.

North Dam,

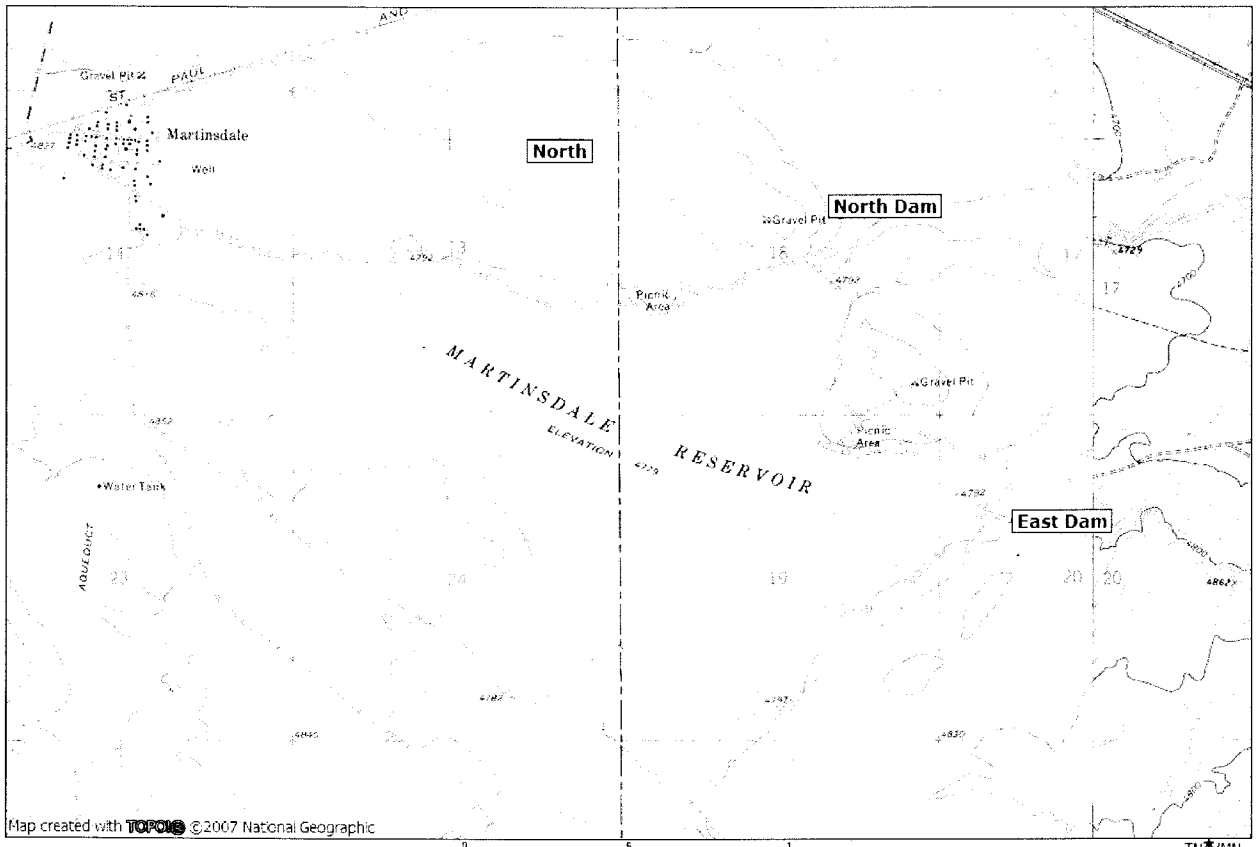


Outlet on North Dam Downstream Face



East Dam

East Dam Spillway



# MIDDLE CREEK DAM (HYALITE)

Fact Sheet

## PROJECT DESCRIPTION

- Located on Middle Creek, 15 miles south of Bozeman on the Gallatin Forest in Gallatin Co.
- Owned by DNRC & managed by SWPB under a U.S. Forest Service Special Use Permit.
- Operated by Middle Creek Water Users Association since 1951. Project consists of:
    - Earthen Dam with concrete panels on downstream side, 125 ft. high, 1,900 ft. long.
    - 5-foot diameter, cast in place steel-lined concrete conduit.
    - One, 54-inch diameter butterfly operating gate and a 54-inch emergency gate valve
    - The gate valves are operated from a tower on the dam crest.
    - The principal spillway has a labyrinth crest inlet and two baffled apron type spillway chutes.
    - The auxiliary spillway is earth lined with a 530 foot-long concrete crest.
- Original construction completed in 1951
- Reservoir stores 10,184 acre-feet at normal full pool, covering 490 surface acres.
- Provides irrigation water for 73 farms and ranches and drinking water for 2,000 households (1/3 of the City of Bozeman water supply is provided by the project).
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, homes, schools, roads, bridges and utilities are in the flood plain.

## PROJECT DEFICIENCIES AND REHABILITATION

- No deficiencies currently exist.
- The dam embankment was raised 10 feet in 1991-1992 as part of a major rehabilitation that included a new spillway, outlet conduit and seepage and drain system. The project meets all current safety standards.

Project Cost (1992 Dollars) $5,200,000. Funding was secured through a federal loan.

## PROPOSED IMPROVEMENTS

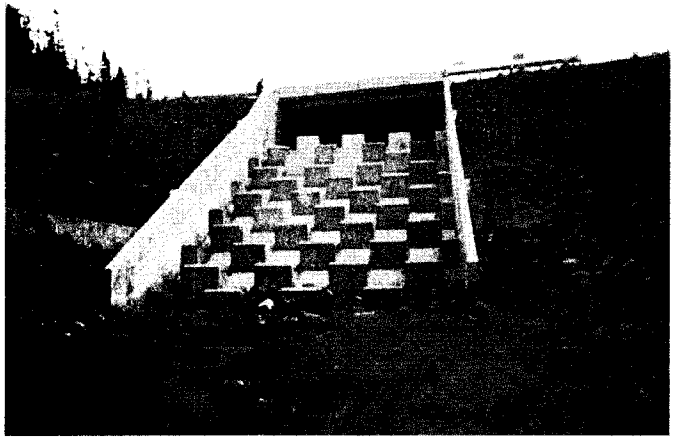
- An updated automated instrumentation system will be installed in the fall of 2008. The new system will improve seepage, drain flow and reservoir monitoring. Included as part of this project was a feasibility study on installing an early warning system.

Project Cost: $137,525.

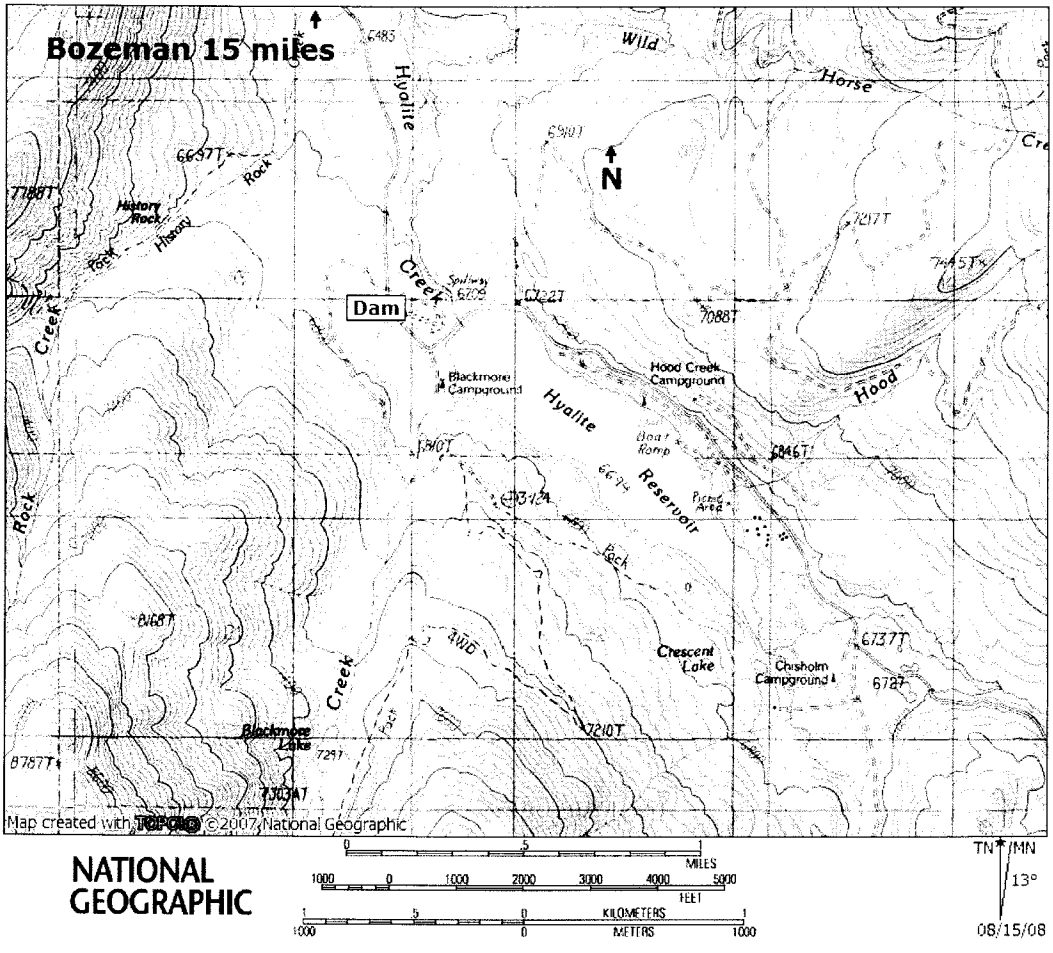
Upstream face

Downstream face

Lower Spillway

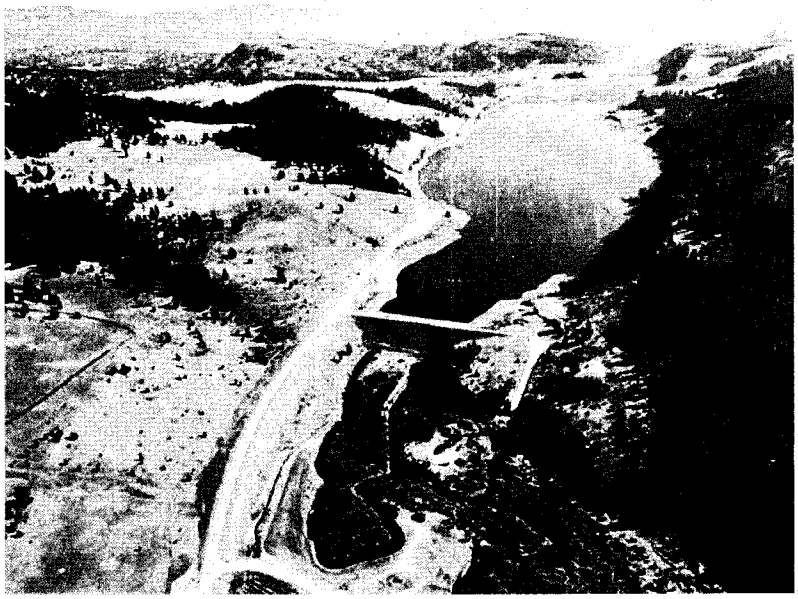


Upper Spillway



# NEVADA CREEK DAM

Fact Sheet



## PROJECT DESCRIPTION

- Located on Nevada Creek in Powell county
- Adjacent to State Hwy 141, between Avon and Helmville
- Nevada Creek is a major tributary of the Blackout River
- Owned by DNRC & managed by SWPB
- Operated by Nevada Creek WUA since 1939

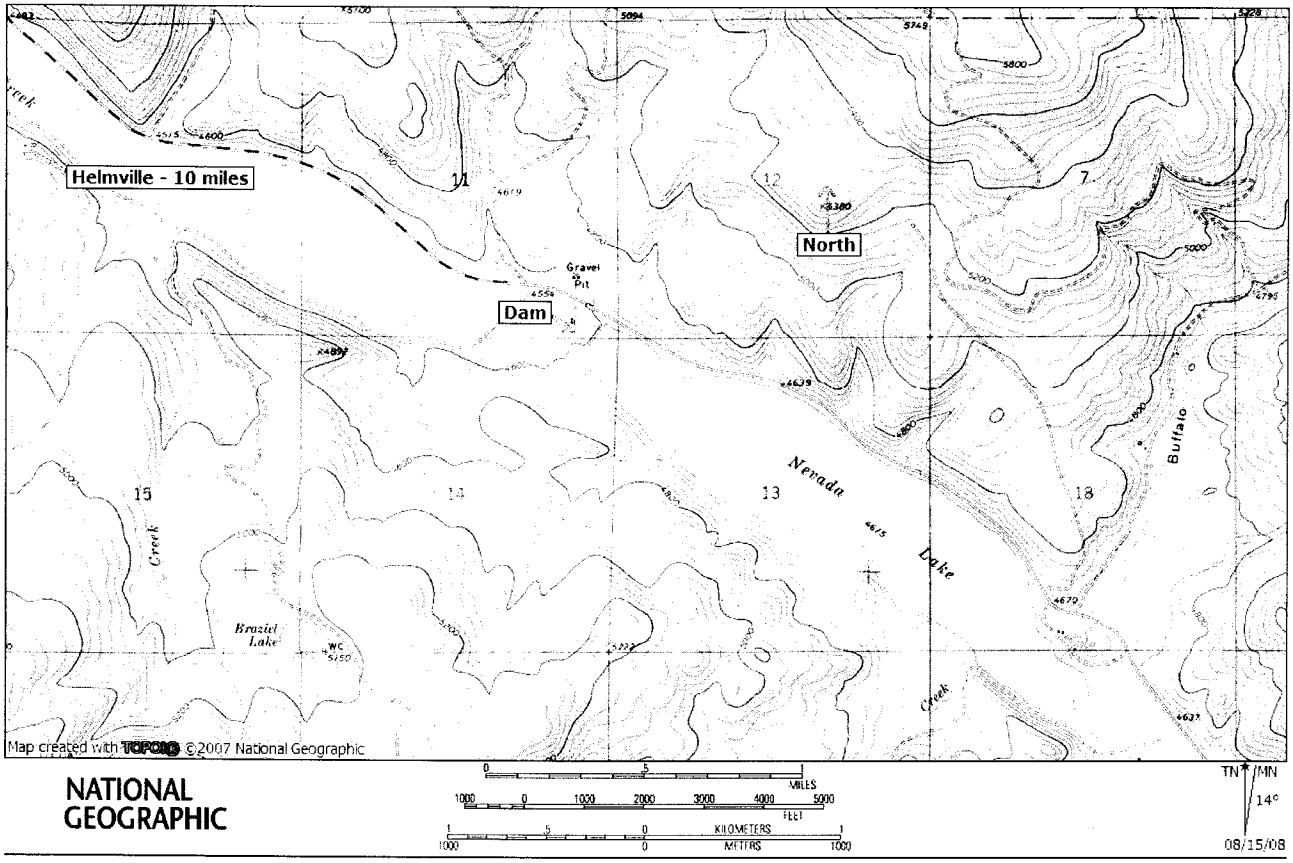
- Project consists of:
  - Earthfill Dam, 105 feet high, 1,083 feet long.
  - Uncontrolled ogee crest concrete chute spillway.
  - 5-foot diameter, 472 foot-long, gated, reinforced concrete outlet conduit.
  - 54-inch diameter gate valve upstream (emergency gate) and 54-inch butterfly valve (operating gate).
- Original construction completed in 1938
- Normal storage at spillway crest is 11,152 acre-feet, covering 368 surface acres.
- 17 water users have 35 contracts and irrigate approximately 5,600 acres with two canals: Douglas Canal (12.7 miles long) North Canal (13.4 miles long)
- The dam is a "high hazard" structure which means that its failure could cause loss of life. Numerous houses, roads, bridges, canals and utilities are located in the flood plain below the dam.

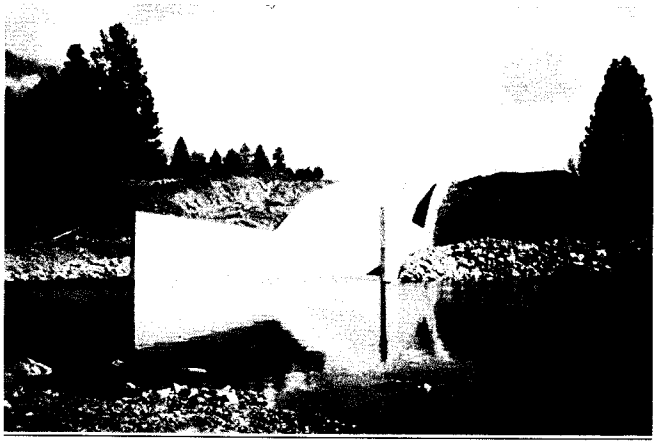
## REHABILITATION

A major rehabilitation was completed in 2003. The project included the replacement of the spillway, extension of the outlet works, relief wells to reduce foundation pressures, and the addition of a toe berm to enhance embankment stability.

The rehabilitation brings the dam into full compliance with current dam safety standards.

**PROJECT COST: $2,000,000**



New Spillway

Upstream Face

# NORTH FORK SMITH RIVER DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on the North Fork of the Smith River in Meagher County
- 10 miles East of White Sulphur Springs
- Owned by DNRC & managed by SWPB
- Operated by Smith River WUA since 1936
- Project consists of:
    - Earthen Embankment Dam, 84 feet high, 1,300 feet long.
    - Labyrinth weir spillway with excavated rock channel.
    - Gated, reinforced concrete outlet conduit
    - 5 foot by 5 foot reinforced concrete, modified horseshoe shaped conduit with manually operated 54-inch diameter emergency slide gate and 54- inch butterfly operating gate.
- Original construction completed in 1936
- Normal storage is 11,500 acre-feet, covering 335 surface acres.
- 29 water users have 40 contracts and irrigate approximately 11,000 acres with one canal (Southside Canal; 13.2 miles long)
- The dam is a "high hazard" structure, which means that its failure could cause loss of life Numerous roads, bridges, and utilities are located in the flood plain. White Sulphur Springs, (pop. 1,018) would begin flooding approximately 3 hours after failure of the dam.

## PROJECT DEFICIENCIES

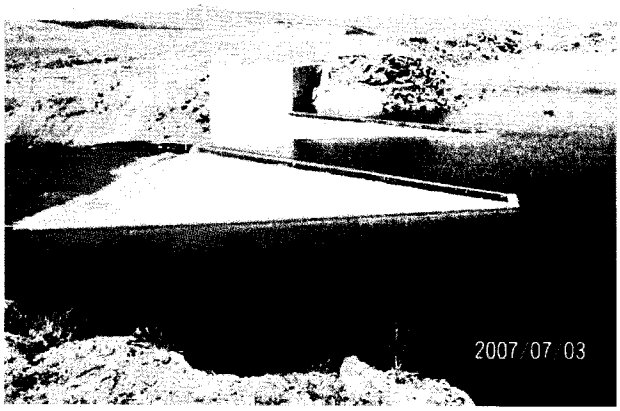
- The dam was rehabilitated in 2006. The rehabilitation brings the dam into full compliance with current safety standards.

## REHABILITATION

The rehabilitation included the following:

- A new structural two-cycle labyrinth weir concrete spillway
- Raising and leveling the dam crest
- Replacing the outlet works terminal structure with a new structure.
- Enlarged the rock spillway channel
- Installed new drains for seepage control

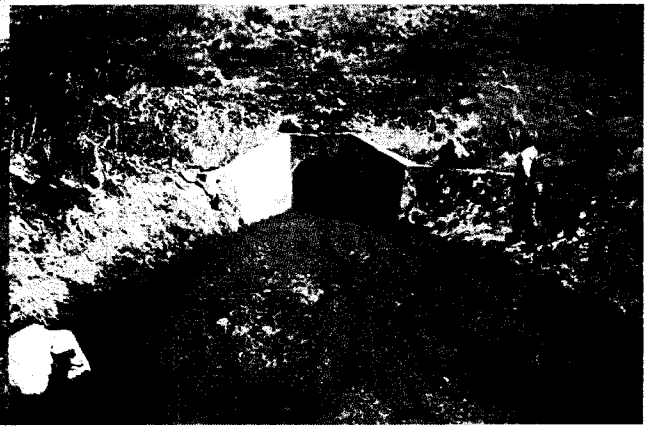
**Project Cost: $825,000**



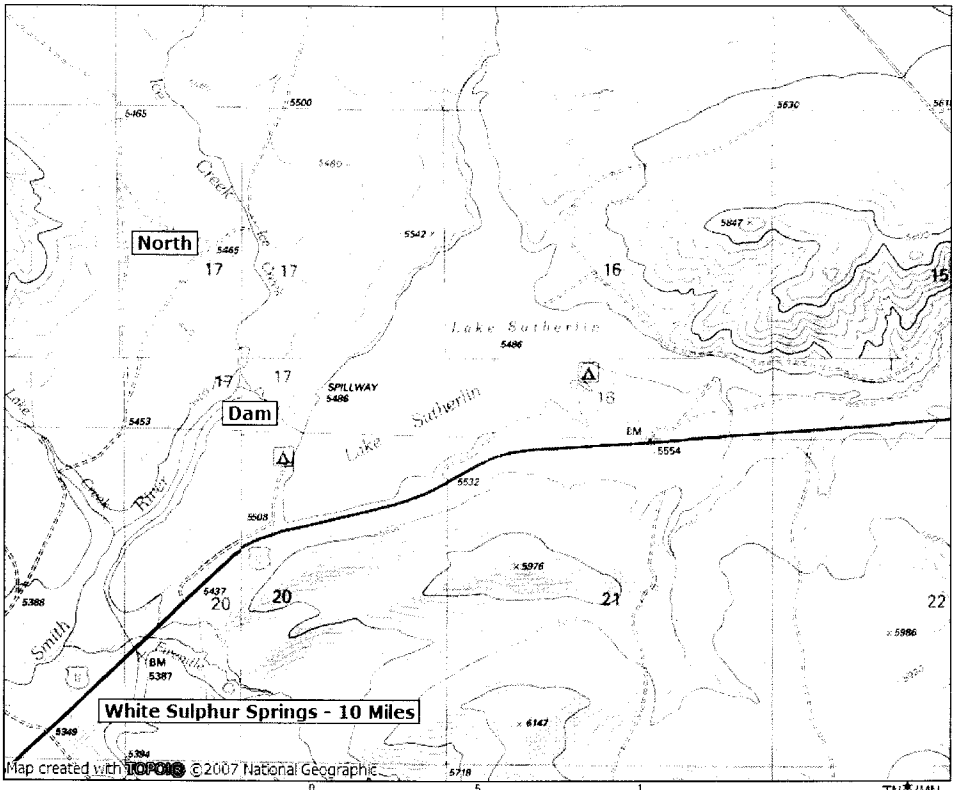

New Spillway

Upstream Face

Downstream Face



New Outlet



# NILAN DAMS

Fact Sheet

## PROJECT DESCRIPTION

- Off-stream reservoir located 7 miles west of Augusta in Lewis & Clark County
- Owned by DNRC & managed by SWPB
- Operated by Nilan WUA since 1952
- The reservoir is a popular recreation site, primarily for fishing. The DFWP manages a Fishing Access Site under a DNRC lease on the south shore of the reservoir.
- Project consists of two dams:

| North Dam: | East Dam |
|---|---|
| ♦ 54 feet high | 51 feet high |
| ♦ 530 feet long | 1,010 feet long |
| ♦ No spillway | Concrete control section spillway |

Each dam has a gated, reinforced concrete outlet conduit, and a 4-foot diameter cast-in-place reinforced concrete tunnel.

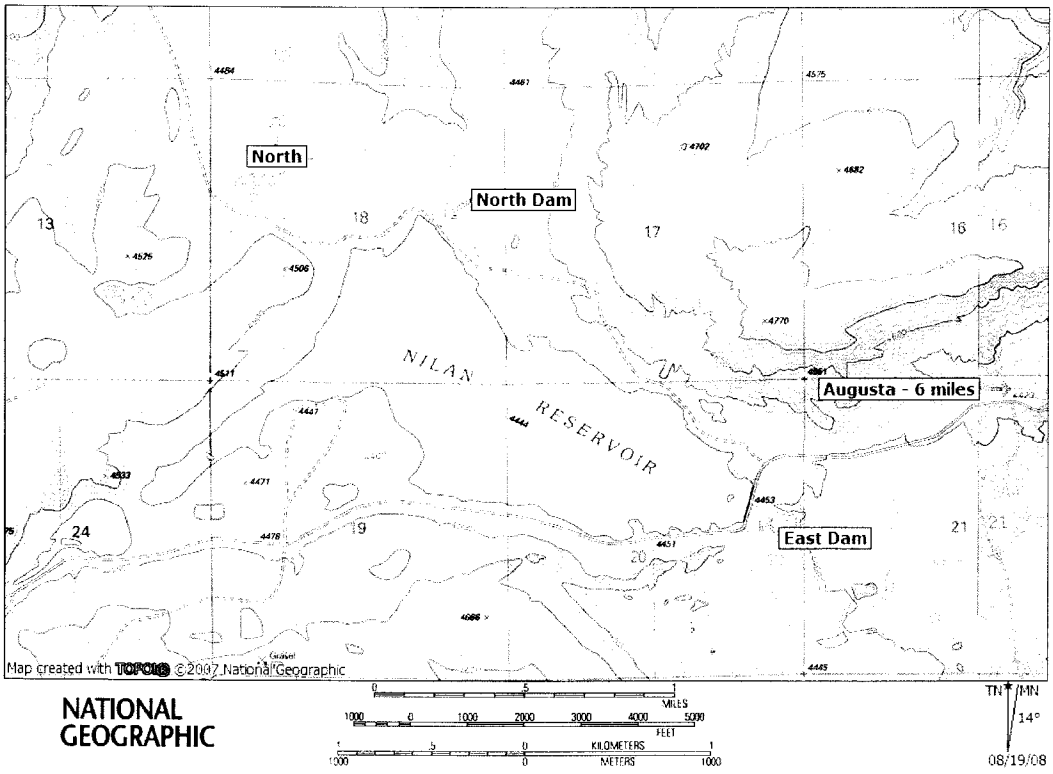
Control towers at each dam are located on the dam crest, consisting of a double chambered wet tower with a 48-inch slide operating gate and 48-inch square emergency slide gate. Controls for the gates are located at the top of the towers.

- Original construction completed in 1951
- Normal storage is 10,092 acre-feet, covering 525 surface acres.
- 27 water users have 53 contracts
  - And irrigate approximately 10,000 acres with two canals (12.7 mile-long North Canal; 5.8 mile-long East Canal).
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. The town of Augusta (population 284) is located 7 miles east and downstream of Nilan Reservoir.
- Numerous houses, roads, bridges, and utilities are located in the flood plain below the dam

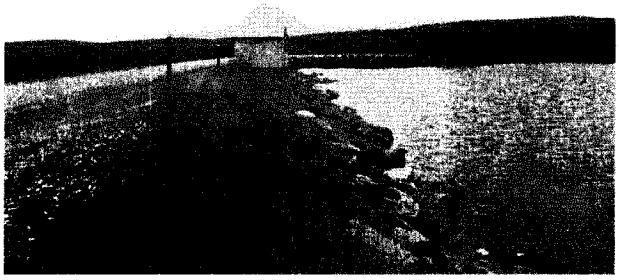
## PROJECT STATUS

- Several major repairs were completed on the East Dam in 1999 to repair sinkholes that developed along the upstream toe. A new outlet terminal structure and drain system was installed at the north dam in the spring of 2008.

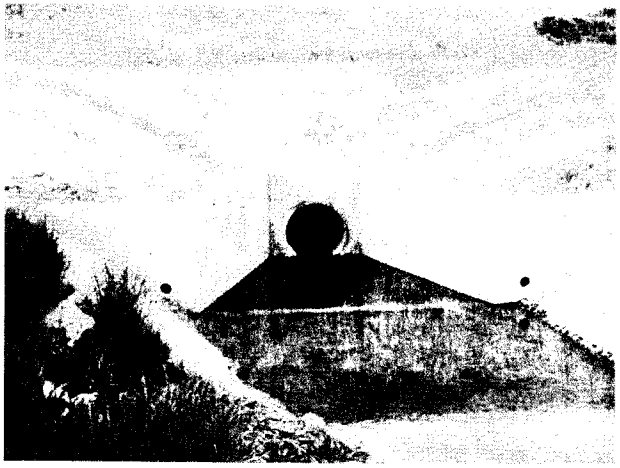
- The project meets or exceeds all current dam safety standards.



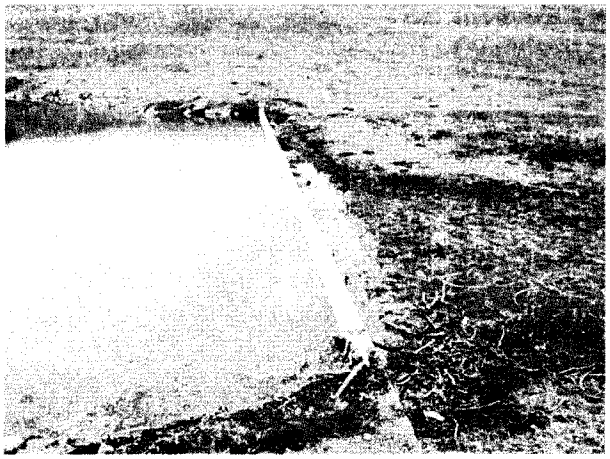

North Dam



East Dam



New Outlet Terminal Structure at North Dam



East Dam Spillway

# PAINTED ROCKS DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on the West Fork of the Bitterroot River, 30 miles southwest of Darby in Ravalli Co.
- Owned by DNRC, managed and operated by SWPB
- Project consists of:
  143 feet-high, 800 foot-long rolled earthfill dam with impervious center.
  Reinforced concrete chute spillway.
  Circular 10-foot diameter concrete lined rock outlet tunnel.
  10-foot diameter, horseshoe shaped reinforced concrete tunnel, with two 5 foot by 8 foot gates (one operating and one emergency), located at the bottom of a vertical wet tower.
- Constructed in 1939
- Storage at full pool is 32,362 acre-feet, covering 655 surface acres.
- DFWP purchases 15,000 acre-feet of water for downstream fisheries
- Painted Rocks Water Users Association has 41 contracts for 10,000 acre-feet of water
- Montana Fish, Wildlife and Parks pays half of the operating and maintenance costs, with the water users paying the remaining half.

## PROJECT DEFICIENCIES

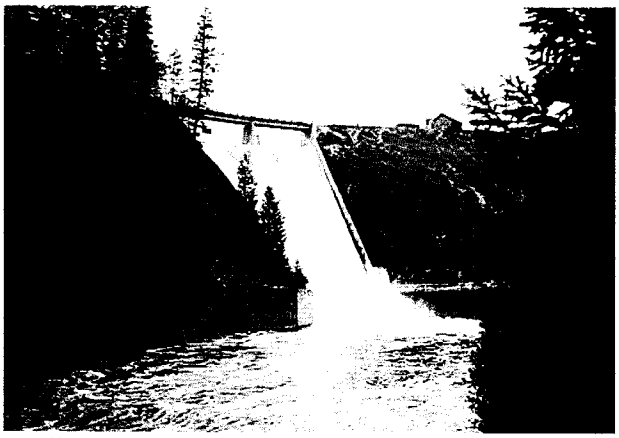
- The spillway stilling basin floor is severely eroded.
- The spillway chute concrete is deteriorated and needs repairs or replacement.
- The spillway configuration has undesirable flow characteristics that reduce its safe capacity.

## PROPOSED ACTIONS TO ADDRESS DEFICIENCIES

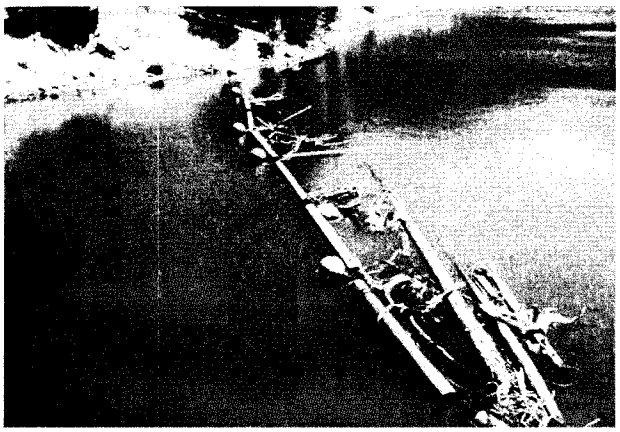
Repairs and maintenance are on-going and have included the following:

- The operating gate was removed, repaired and reinstalled during the summer of 2008. Cost of the repair was $53,738, paid for by the water users.
- A feasibility study that assessed the condition of the spillway and gate repairs was conducted was completed in 2007. Cost: $130,874, paid by the DNRC.
- The emergency gate roller chain was replaced in 2006 at a cost of $50,377. The water users paid the majority of the cost.
- The gate hoist mechanism was rehabilitated in 2005. The $23161 cost was paid for entirely by the water users.
- A new log boom and security fence were installed in 2004. The water users paid for the log boom and the DNRC for the fence. Costs: Log Boom – $20,453; Fence - $4,916
- A spillway rehabilitation study is on-going.

Est. cost for rehabilitation includes $5 million for gates, $8 million for the spillway, and $750,000 for the stilling basin.



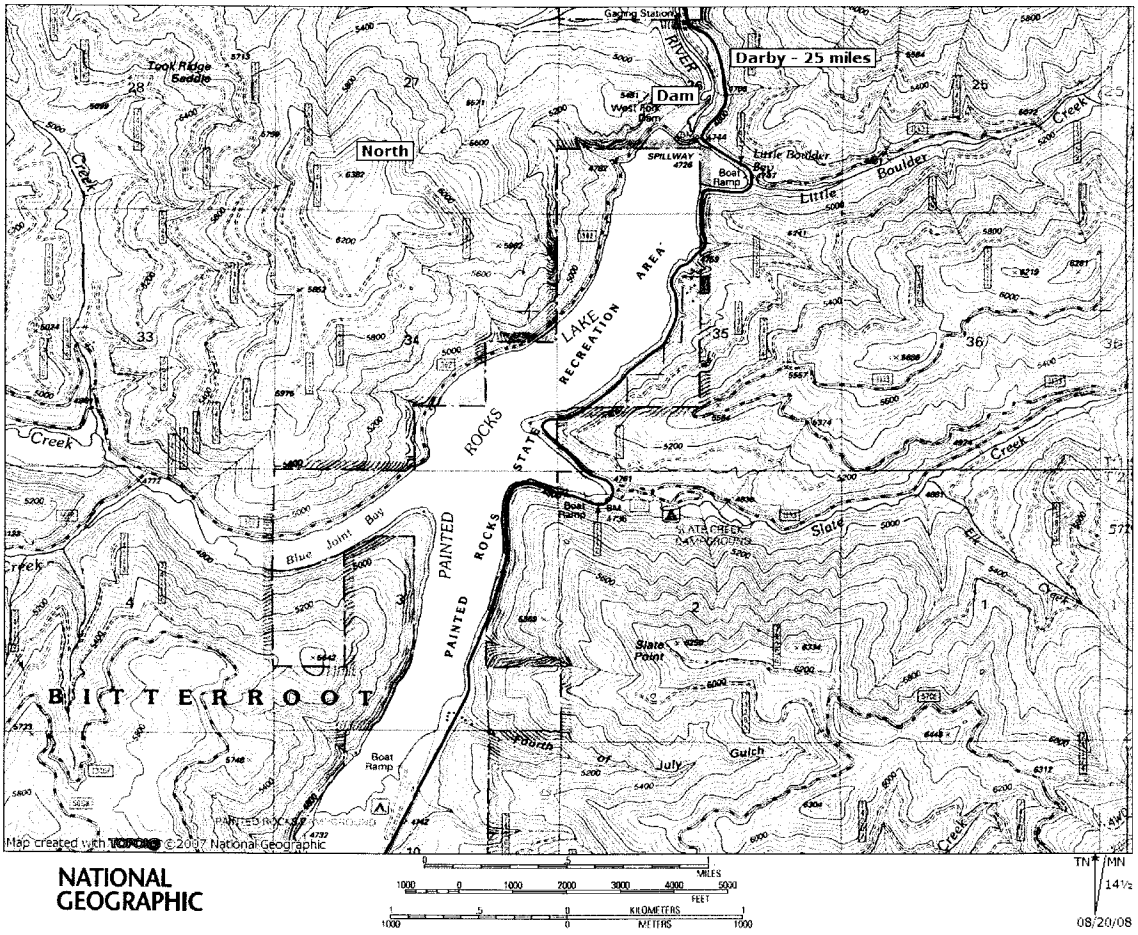
Spillway



Log Boom

Forest Service Access Road across dam

Painted Rock Reservoir



# RUBY DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on the Ruby River, in Madison County, 7 miles south of Alder
- Owned by DNRC and operated by Ruby Water Users Association since 1938
- Project consists of:
  - Earthen Embankment Dam, 111 feet high, 846 feet long
  - Reinforced concrete chute spillway
  - Gated, reinforced concrete 90" outlet conduit
- Constructed in 1938
- Storage at full pool is 37,612 acre-feet, covering 970 surface acres.
- Two canals deliver water to purchasers: West Bench, 12 miles long, 85cfs capacity; Vigilante, 26 miles long, 115 cfs capacity
- 191 water users have 225 contracts for 38,845 acre/feet of water

## PROJECT DEFICIENCIES

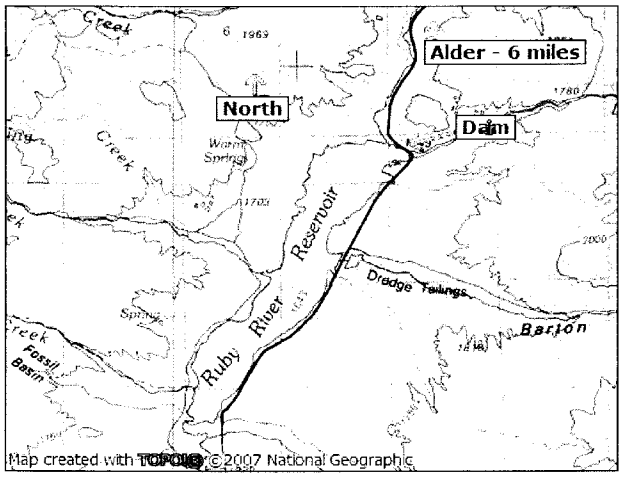
- Severe concrete deterioration exists in the spillway floor and walls. Spillway replacement is needed to correct the deficiencies.
- Excessive seepage may threaten the structural integrity of the spillway.

## PROPOSED ACTIONS TO ADDRESS DEFICIENCIES

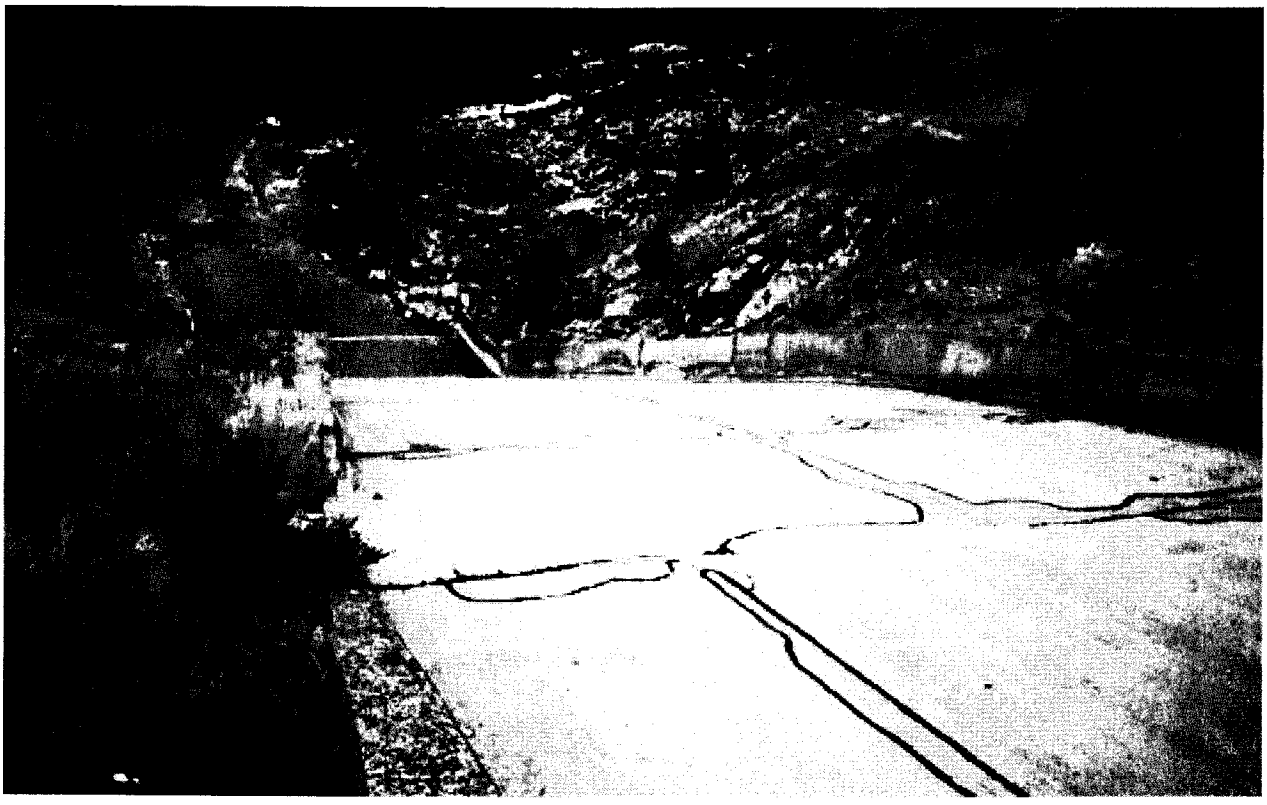
- A feasibility study to evaluate the problems at Ruby Dam at Ruby Dam was completed in 2007 by HLM Engineering of Billings . The $285,000 feasibility study cost was authorized by the 2006 Legislature and paid by the DNRC.

- This project is in need of major rehabilitation. The preferred alternative identified in the feasibility study for rehabilitation, which includes a new spillway, outlet conduit, drains, access road and additional storage that could be marketed for beneficial uses, will bring the dam into full compliance with current safety and design standards and greatly reduce the state's liability.
- The proposed rehabilitation will also allow for future hydropower development.

**Estimated Cost: $13,000,000**



**Ruby Dam**



**Ruby Dam Spillway**

# TONGUE RIVER DAM

Fact Sheet

## PROJECT DESCRIPTION

- Located on the Tongue River in Big Horn County, 5 miles north of Decker.
- Owned by DNRC & managed by the Tongue River Water Users Association since 1938.
- Project consists of:
    - Zoned Earthfill Dam, 93 feet high, 1,824 feet long
    - Uncontrolled, 150 foot-wide, 560 foot-long concrete labyrinth weir principle spillway. Emergency spillway consists of roller compacted concrete with conventional concrete encasement stair step chute with an ogee crest, 650 feet-wide.
    - 16-foot horseshoe-shaped concrete auxiliary outlet tunnel; downstream and upstream wet wells with a 4.5 foot by 7 foot fixed wheel emergency gate and cast iron operating sluice gate.
- Original construction completed in 1940 by the State Water Conservation Board.
- Stores 79,071 acre-feet at normal full pool, covering 3,700 surface acres.
- A very popular recreation site, with Tongue River State Park, managed under lease by the MT Dept. of Fish, Wildlife and Parks, located on the west shore of the reservoir.
- Provides a portion of the Northern Cheyenne R=Tribe's federally reserved water right.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life. Farms and ranches, roads, bridges, and utilities are located in the flood plain.

## PROJECT DEFICIENCIES AND REHABILITATION

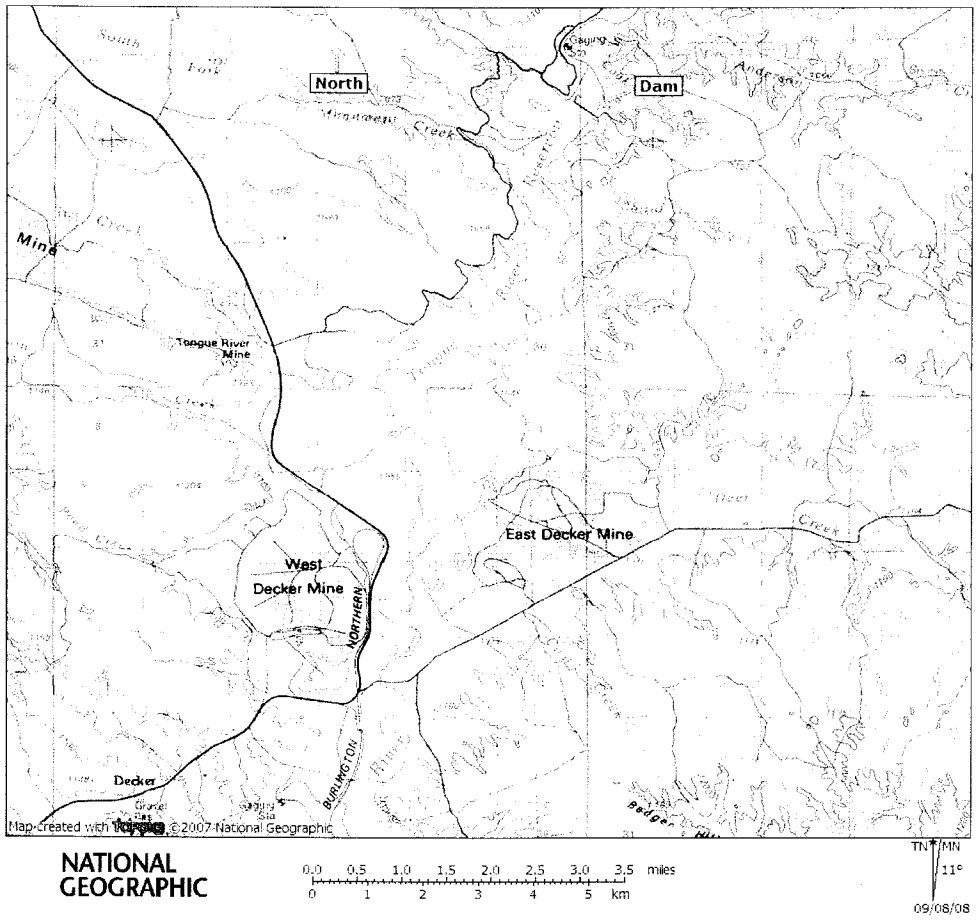
From 1996 to 1999 the DNRC completed a major rehabilitation of the dam. The dam, spillways and outlet works are in good condition and meet or exceed existing dam safety standards. The rehabilitation included:

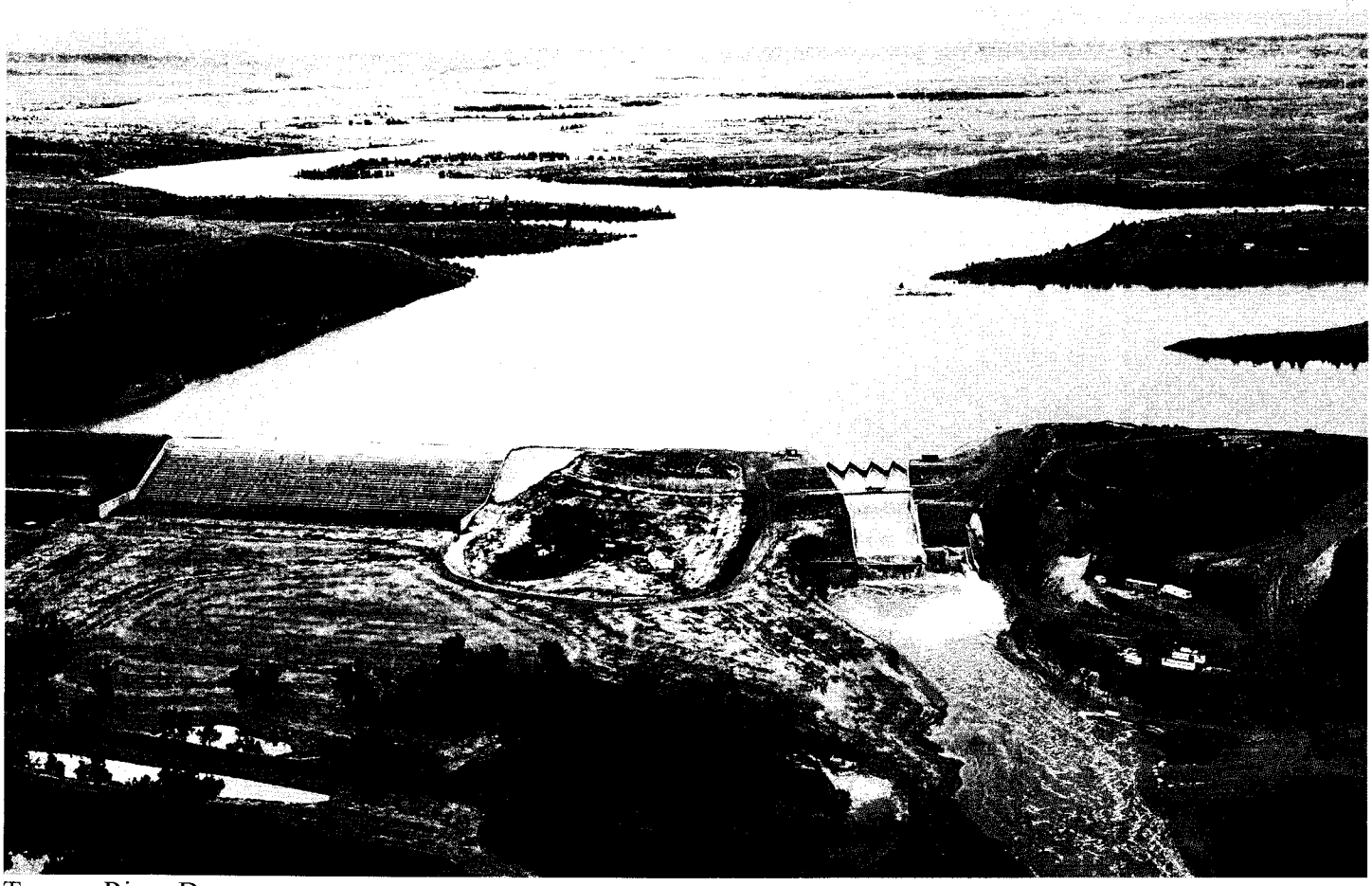
- Raising the dam crest an additional 4-feet, providing up to an additional 20,000 acre-feet of storage.
- Construction of a new primary outlet tunnel and emergency spillway.
- Replacing the principle spillway.
- Improvements to the drain system.
- Improvement to access and maintenance roads.

Rehabilitation cost (1999): $52,000,000

The rehabilitation costs were shared between the DNRC, U.S. Bureau of Reclamation and Northern Cheyenne Tribe.

Repairs are continuing on cracks that appeared in the emergency spillway concrete steps.
Estimated cost of the crack repairs is $500,000.



Tongue River Dam

# WILLOW CREEK DAM

Fact Sheet

## PROJECT DESCRIPTION

- Impounds Willow and Norwegian Creeks, located in Madison County, 3.5 miles east of Harrison, constructed in 1938.
- Owned by DNRC; operated by the Willow Creek Water Users Association since 1938.
- Project consists of:
  - 105 feet-high, 453 foot long, zoned earth and rock fill dam.
  - Uncontrolled ogee crest concrete chute spillway.
  - 60-inch horseshoe shaped 362 foot long concrete outlet conduit.
  - One 54-inch main operating butterfly valve and one 54-inch emergency gate valve.
- Storage at full pool is 18,000 acre-feet, covering 885 surface acres.
- The Willow Creek Water Users Association has 151 contracts for 11,900 acre-feet of water
- The reservoir is a popular recreation site. The Dept. of Fish, Wildlife and Parks, under a DNRC lease, manages a Fishing Access Site on the west shore of the reservoir .

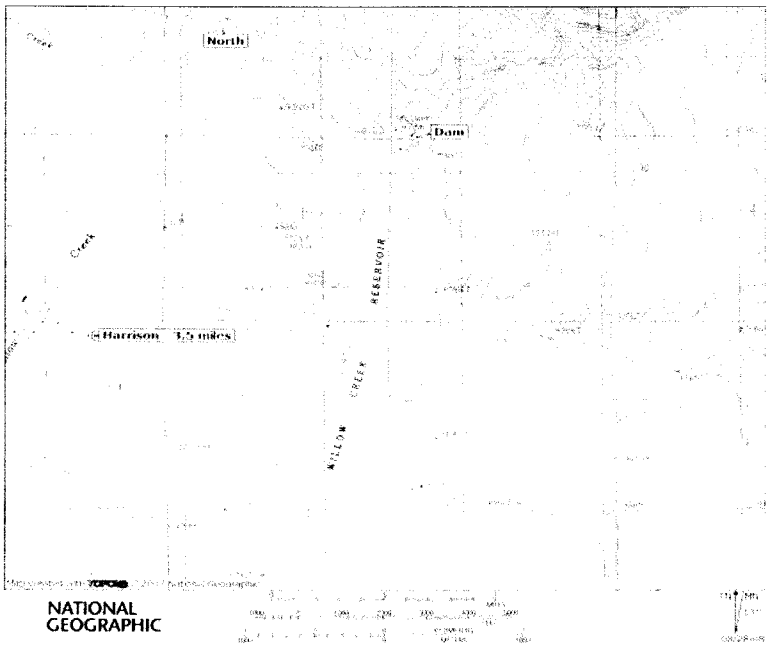
## PROJECT DEFICIENCIES

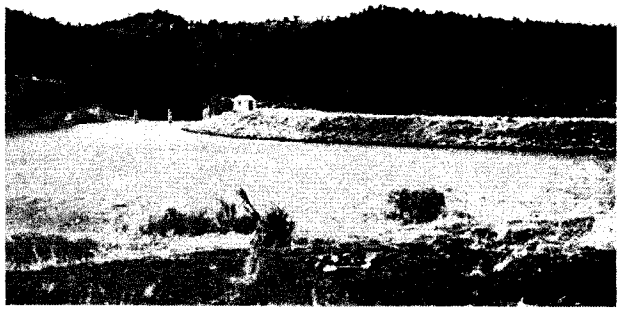
- The spillway does not meet current safety standards and is not capable of passing the design flood event. The outlet conduit also needs to be assessed for deficiencies. Age related concrete deterioration exists in the spillway wall, floors, and outlet conduit.

## PROPOSED ACTIONS TO ADDRESS DEFICIENCIES

- Replace the spillway with a new structure that meets current safety design standards.
- Install a new outlet conduit.

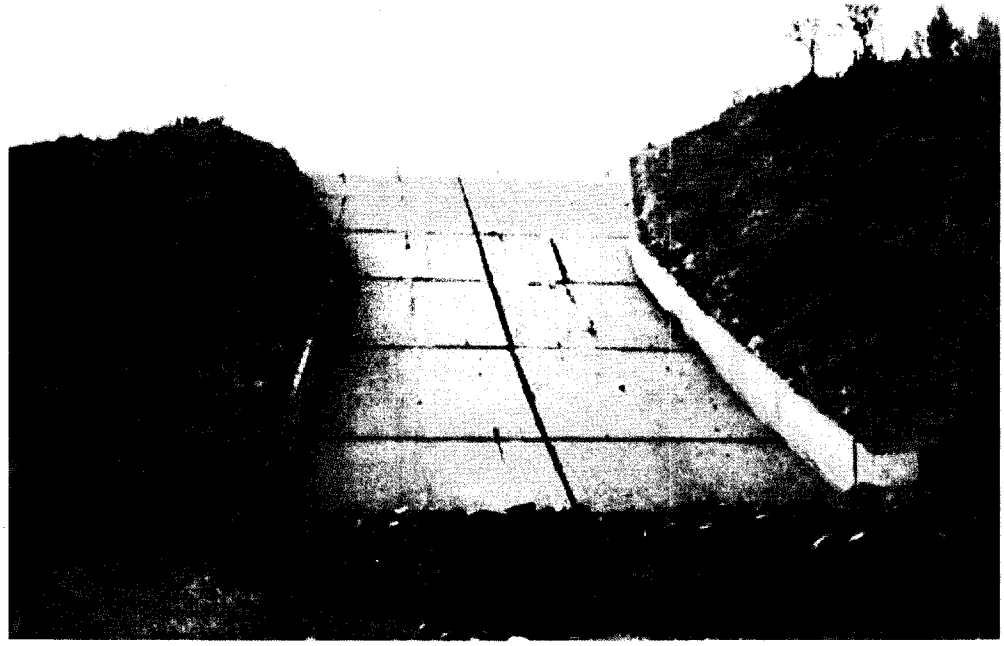
Estimated Cost: May Exceed $4,000,000



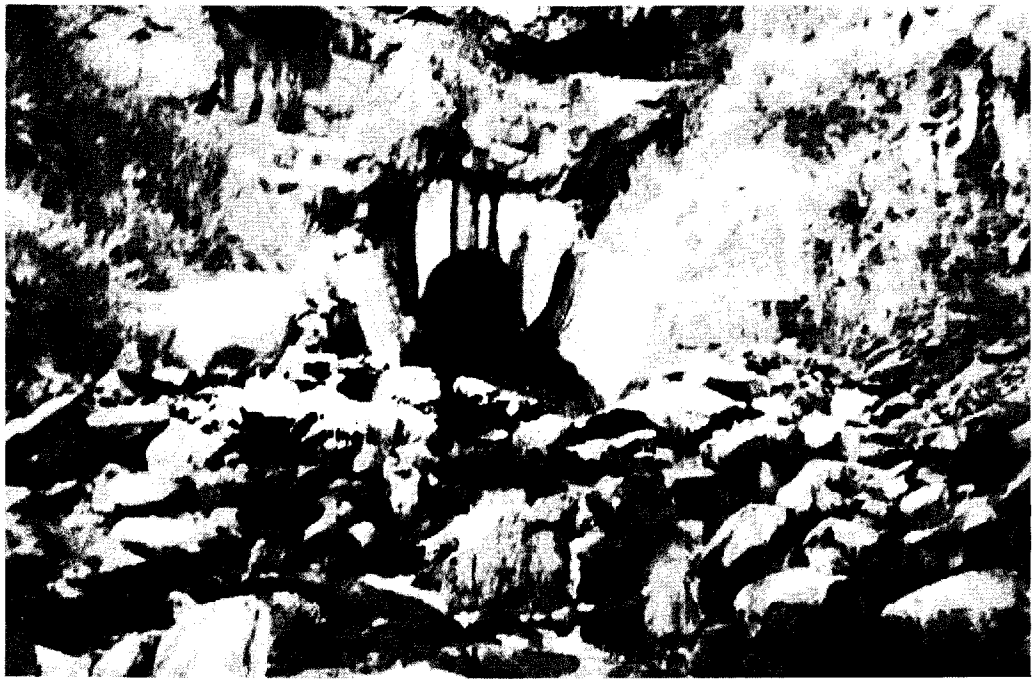


Upstream face

Downstream face



Spillway



Outlet

# YELLOW WATER DAM

Fact Sheet

## PROJECT DESCRIPTION

- Impounds Yellow Water Creek, located in Petroleum County, 12 miles southwest of Winnett, constructed in 1938.
- Owned by DNRC; operated by the Yellow Water Water Users Association since 1938.
- Project consists of:
    - 37 foot-high, 1,695 foot-long, earthfill dam.
    - Uncontrolled trapezoidal earth and rock lined spillway.
    - 42-inch reinforced concrete pipe outlet, 150 foot-long.
    - One 42-inch slide gate valve with manual operator.
- Storage at full pool is 3,842 acre-feet, covering 490 surface acres.
- The Yellow Water Water Users Association has 4 contracts for 2,000 acre-feet of water.
- The west and south shores of the reservoir are part of the War Horse National Wildlife Refuge, managed by the U.S. Fish and Wildlife Service. The reservoir serves as an important nesting area for waterfowl.
- The dam is a "high hazard" structure, which means that its failure could cause loss of life.

## PROJECT DEFICIENCIES AND CORRECTIVE ACTIONS

- In 1979, the original spillway was eroding and starting to threaten the embankment. A new spillway was configured running parallel to the embankment utilizing the original spillway entrance.

- In 1980 the Army Corps of Engineers performed an inspection and condemned the outlet due to excessive corrosion of the original CMP.

- Yellow Water Dam underwent a two phase rehabilitation project in 1985. Phase I included the embankment excavation and removal of the original outlet conduit. Phase II included the construction of a new outlet conduit (42-inch diameter reinforced concrete pipe), the inlet and outlet structures, cleaning the original gate and placing riprap on a portion of the upstream face.

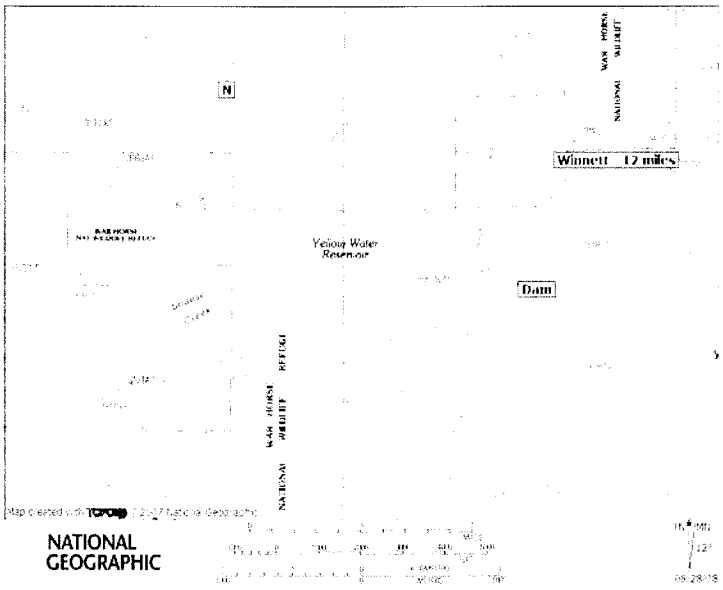
- In 2004 the SWP installed 5 monitoring wells with deep and shallow piezometers to enhance the monitoring program. The reservoir has not filled since that time.

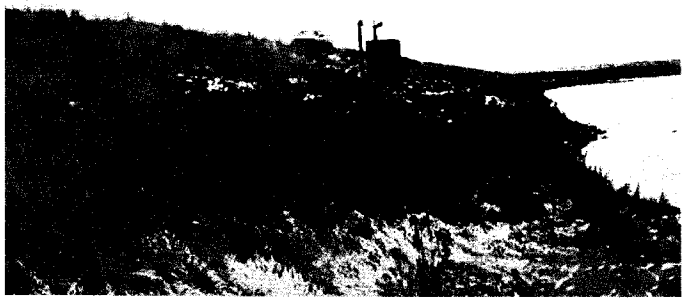
## FUTURE NEEDS

- The intake structure has a history of plugging up with sediment when the gate is closed during the off season. The intake structure may have to be modified or redesigned and replaced to prevent plugging.

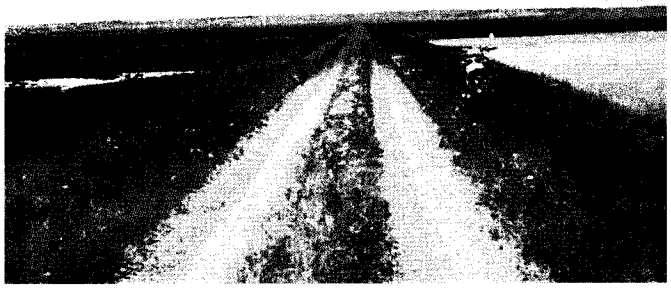
- Seepage has been observed in the vicinity of the left abutment. The drain system may have to be improved to better control and monitor seepage flows.

Estimated Cost of the above repairs: $500,000

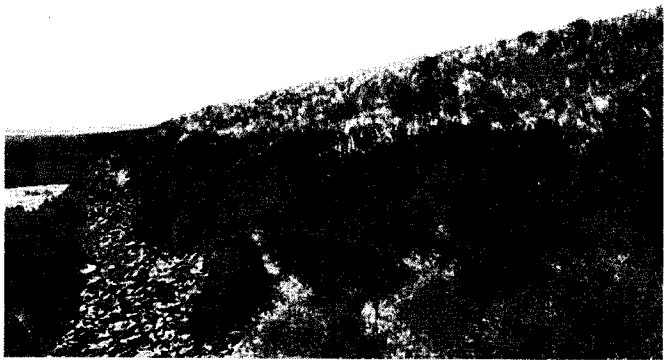


**Upstream face**



**Dam Crest**



**Downstream face**

East Fork Reservoir

Persons with disabilities who need an alternative accessible format of this document should contact:

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